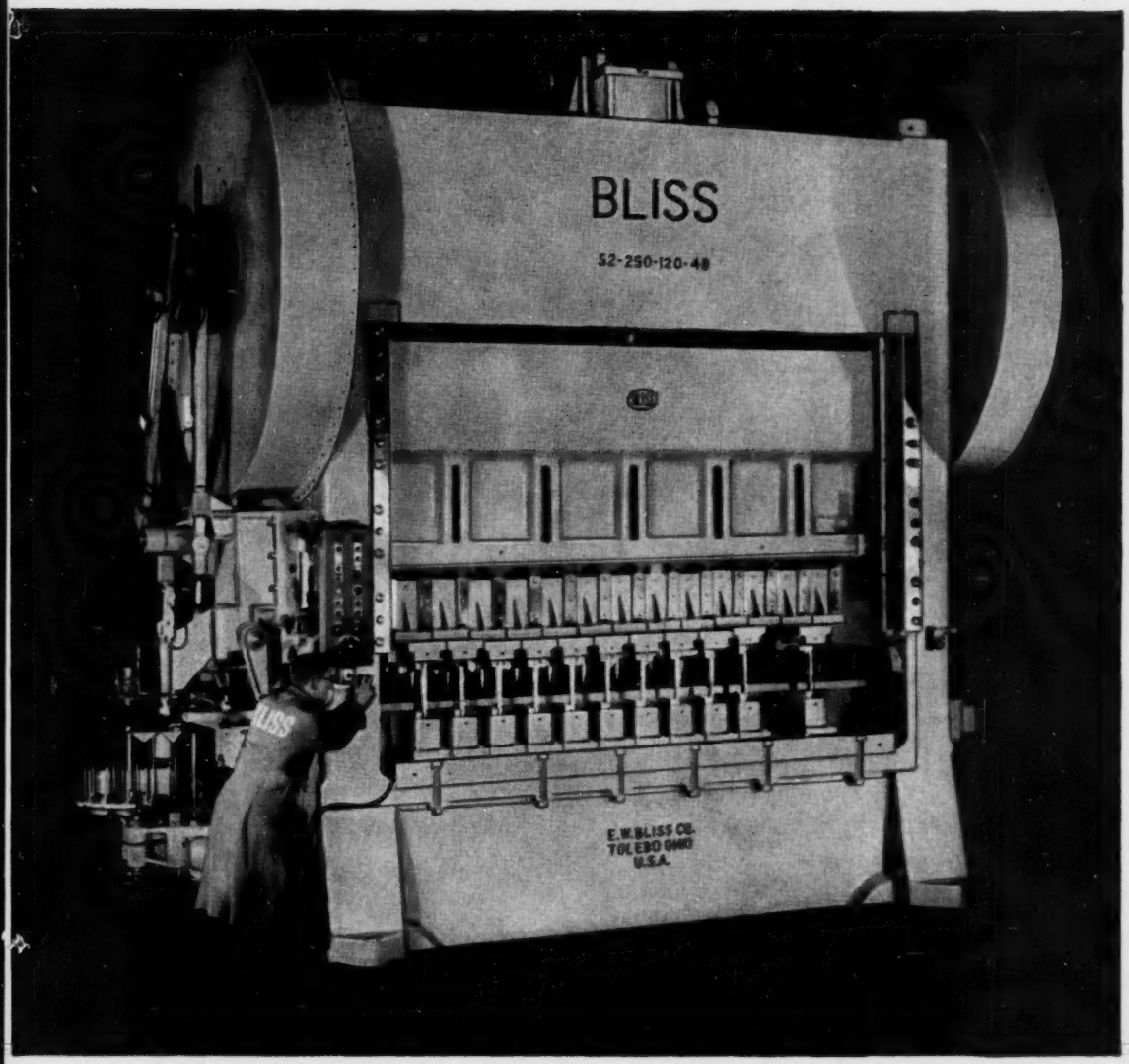
FEBRUARY, 1955—SIXTY-FIRST YEAR

MACHINERY



At Ford's Ypsilanti plant:

BLISS' 1000TH TRANSFER FEED PRESS

This press feeds itself, checks and corrects errors, performs 11 press operations, and delivers 28 completed Ford starter brush end plates per minute—*all automatically.*

Press operations on the 0.090" steel blank include six draws, flanging, ironing, piercing, lancing and trimming. Tolerance: as close as 0.0005".

Outstanding feature, however, is the many automatic controls which act as safeguards against jamming, double feeds and the like. Practically everything that can go wrong has been anticipated and guarded against—automatically. All the attendant has to do is load the transfer feed table: the press does the rest.

Only one of the many specialized presses designed by Bliss, this transfer feed press is a typical example of the resourcefulness available to industry through the services of

E. W. BLISS COMPANY
CANTON, OHIO

BLISS
SINCE 1857

is more than a name...it's a guarantee

VERSATILITY GOES TO WORK

on these 19 different parts

. . . they are all precision finished on a single Heald Bore-Matic

YOU'VE HEARD a lot about Heald versatility. In the photograph above, you can *see* it. For these 19 different aircraft parts are interchangeably accommodated by any one of six standard Model 221 Bore-Matics.

Purchased as "bare" machines, they were equipped by the customer with interchangeable tooling and fixtures to cover the wide range of operations required and take full advantage of the versatility that's built into every Heald Bore-Matic. Either the work or the tooling can be rotated and several different surfaces can be borized simultaneously or in sequence at a single loading.

This example illustrates three important facts. One—you don't need a special machine for each different part or operation. Two—the advantages of Heald borizing are not limited to long-run jobs. Three—you can either do your own tooling or let Heald supply the complete package.

When it comes to borizing, internal grinding or rotary surface grinding . . .

It pays to come to Heald!

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

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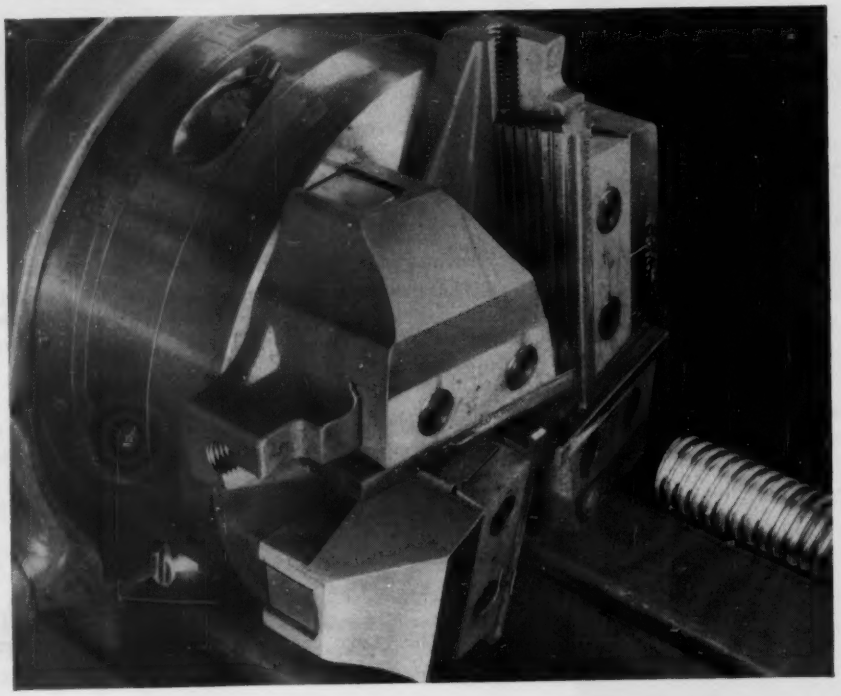
This Could Be



347 stainless steel—1⅝" Acme threads 15⅞" long

420-C

Your Threading Job!

If it were, your LANDMACO Threading Machine would be threading valve stems in *2½ minutes* that formerly required nearly 3½ hours. Thread finish and concentricity would be improved. In addition, you could produce many other sizes and types of threads *on this same machine.*

This is one example of the daily performance of LANDIS Equipment in thousands of plants throughout the world Nearly 350 Threading Machines and Threading Tools comprising the Landis Line will produce all types of internal or external, straight or tapered threads through Cutting—Grinding—Tapping—or Rolling.

While this may not be your Threading Job, LANDIS Threading Equipment can do an outstanding thread production job in your plant. Send us your specifications, and let us suggest the Threading Equipment best suited to your need. Our Engineering Department will design any special equipment, fixtures, or methods required by unusual operations.

THE WORLD'S LARGEST MANUFACTURERS OF THREADING EQUIPMENT - CUTTING - TAPPING - GRINDING - ROLLING

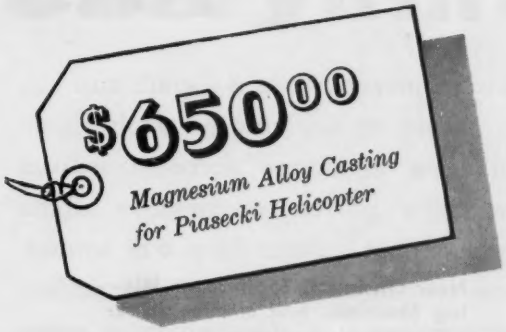
LANDIS *Machine* COMPANY

WAYNESBORO • PENNSYLVANIA • U. S. A.

THE FELLOWS METHOD ..when

THE *Fellows*

you can't afford "rejects"



For an example, let's take a look at this transmission part that's used in a Piasecki Helicopter. It is an intricate magnesium alloy casting valued at $650.00. Two 27.750 inch pitch diameter internal gears, with the teeth in line, have to be cut in the large end. The lower internal is located close to the web. Tolerances are close for the nature and size of the piece. The necessity for keeping the percentage of "rejects" at a minimum is obvious.

The Steel Products Engineering Company of Springfield, Ohio cuts the gears in this piece on a Fellows Gear Shaper. Using a 5-inch stroke of the cutter, both gears were cut at the same setting, thereby keeping the teeth in line. Cutting the internal close to the web was no problem because of the ability of the Gear Shaper to cut into a narrow recess. Tolerances were held because of the control of accuracy built into the cutter and the machine. Consequently, "rejects" *were* held to a minimum.

The Fellows Method affords versatility and cost economy. It produces profits by keeping quality up and costs down.

Ask any of our offices for information about the complete line of Fellows Gear Shapers, Shaving Machines and Gear Inspection Instruments.

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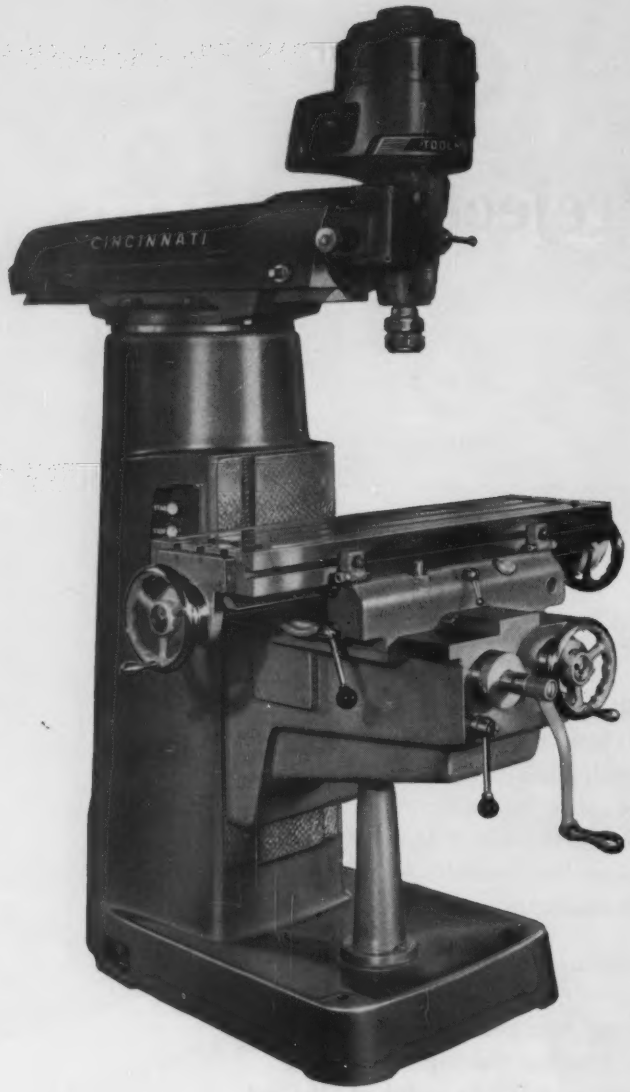
For more information on products advertised, use Inquiry Card, page 241



The new

has

New Cincinnati Toolmaster Milling Machine. Built in three styles:
1A — Manual feed to quill, 1 hp motor
1B — Power feed to quill, 1 hp motor
1C — Heavy duty head, 2 hp motor
Range: 16" table traverse, 10" cross, 17" vertical
Complete data in catalog No. M-1870.

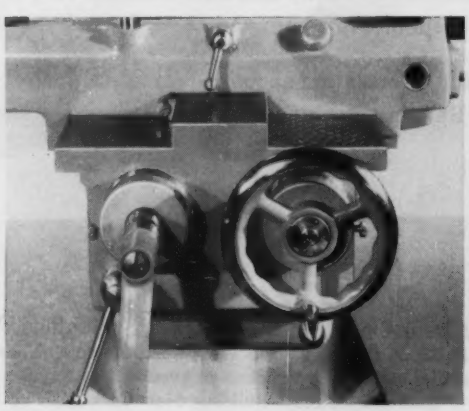
CINCIN

Quick pic story of Toolmaster features

CINCINNATI

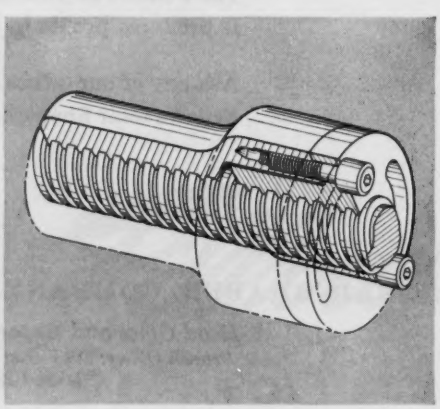
Extra Wide Knee

Has two advantages: wide square gibbed bearing ways for maximum strength; narrow guide for smooth cross adjustment.



Backlash Problem Solved

The anti-backlash device enables the operator to feed the table to the right or left as desired.



Toolmaster everything

. . . and there's a good reason. Before a single drawing was put on paper, our market research engineers went into shops everywhere, asking what was wanted in a small manual feed toolroom milling machine. Operators, tool engineers, machine tool buyers, maintenance supervisors . . . all had a voice in the design of the new CINCINNATI Toolmaster. Yes, there's a very good reason why these new milling machines have everything desired for fast, low-cost milling operations in toolrooms, contract shops, tool and die shops, repair departments, and others. Just take a look at the five typical features illustrated below. They were operator-approved in actual field tests; management-approved in cost-of-production records. Would you like to have more information? Just write for new four-color catalog, No. M-1870.

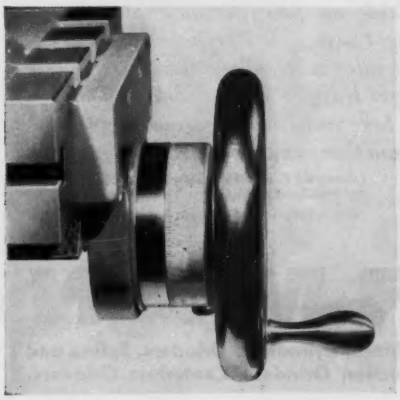
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

NATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

Extra Large Dials

Graduation lines are large and legibly stamped; easy to match without eyestrain.



Shaping Attachment

Jobs that would often be assigned to another machine can stay right on the Toolmaster with the ruggedly constructed Shaping Attachment.

Oil-Shot Lubrication

Saddle-table parts and way bearing surfaces are lubricated from centralized oil-shot system.

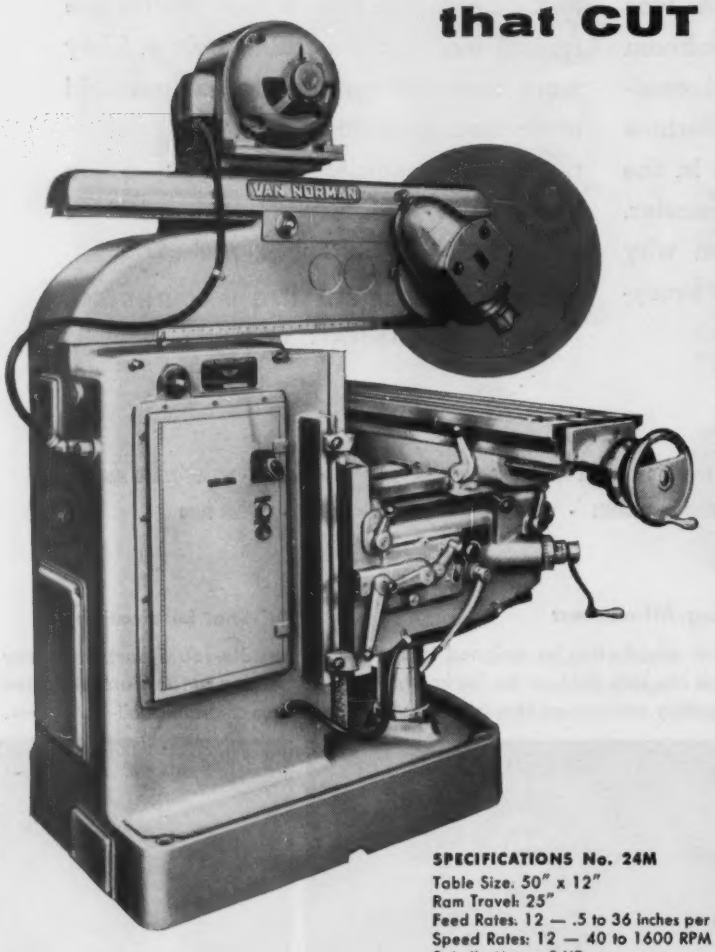
...the NEW

VAN NORMAN Ram-Type Millers

give you the advantages of

EXTRA FLEX-ABILITY and CUT-ABILITY

that CUT milling costs



SPECIFICATIONS No. 24M
Table Size. 50" x 12"
Ram Travel: 25"
Feed Rates. 12 — .5 to 36 inches per min.
Speed Rates: 12 — 40 to 1600 RPM
Spindle Motor 5 HP

Van Norman and only Van Norman Ram-Type Milling Machines give you the exclusive advantage of the adjustable cutterheads mounted on heavy sliding rams which provide *maximum flex-ability.* This means you get more production because there is less idle machine time.

And for *more cut-ability* . . . powerful spindle motors with up to 10 HP provide ample power for every milling cut. The extra heavy-duty rams, larger, heavier columns, bases and knee, saddle and table assemblies provide *maximum rigidity.*

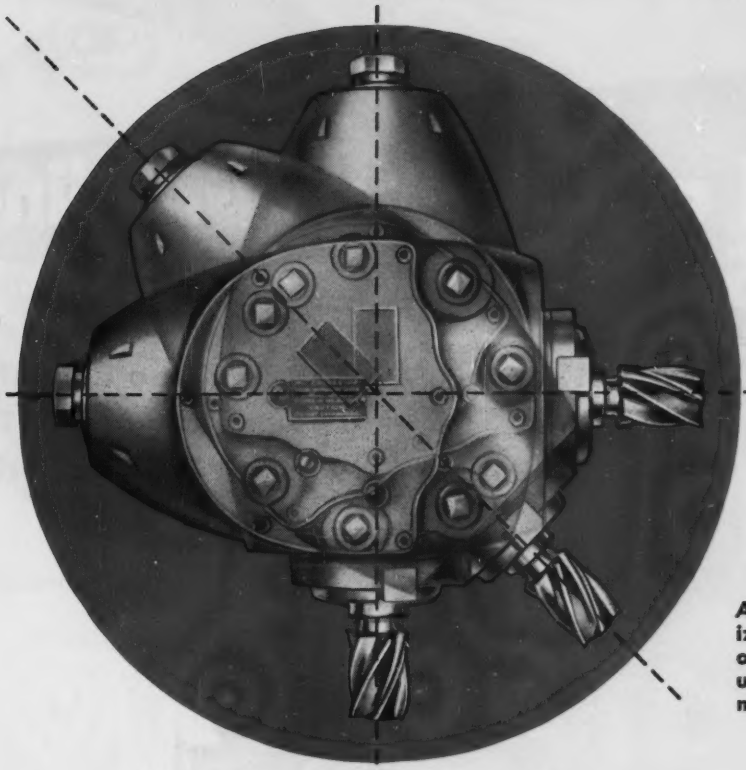
Write for Bulletins describing these versatile Van Norman Ram-Type Millers, today.

Don't wait . . . for extra profits install a Van Norman Machine now! They are available on four purchase plans — Outright sale . . . Purchase on conditional sales contract up to 5 years . . . Straight lease . . . Lease with option to buy. See your dealer or write Van Norman Company.

Lease and Conditional Sales Contracts not available to Export

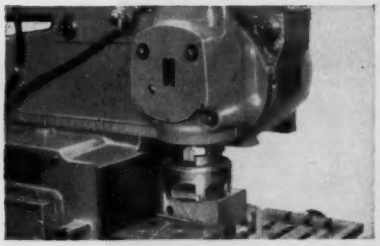
VAN NORMAN

MANUFACTURERS of—Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

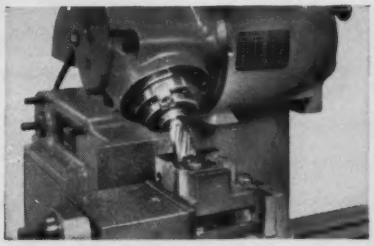


Adjustable Cutterhead **permits horizontal, vertical or angular milling on one machine. Simplifies set-up and tooling . . . reduces idle machine time.**

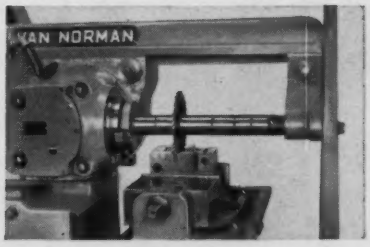
for greater Flex-Ability



With the cutterhead locked in the vertical position, a vertical milling operation is performed on the workpiece.

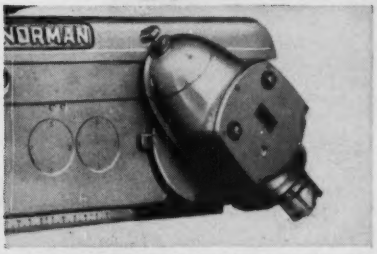


With the workpiece in the same set-up and the cutterhead in angular position, a V is milled in the work. Angular range of cutterhead is 0 degrees to 90 degrees.

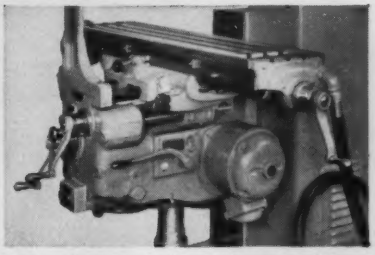


With the cutterhead in the horizontal position, a slot is milled in the work. Note that the set-up has not been changed.

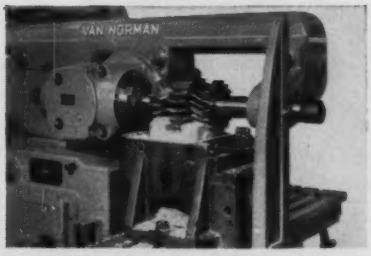
for greater Cut-Ability



New heavy-duty adjustable cutterhead, mounted on massive ram with 22" bearing ways on column assures maximum rigidity and accuracy.



Rugged table, saddle and knee assemblies are designed as an integral unit for rigidity. New heavy motorized knee has direct drive 1HP feed motor.



A heavy horizontal multiple milling cut being performed on the miller. The rigidity of the machine prevents chatter.

COMPANY

SPRINGFIELD 7, MASSACHUSETTS

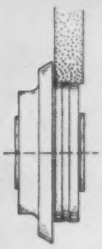
External and Internal Grinding In One Setup

A cost-cutting advantage of Landis 10" and 12" Type CH Universal Grinders.

LANDIS

precision grinders

External Diameter is Ground

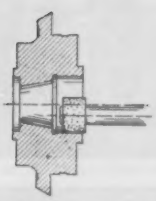


Wheel Head Moves Back by Power

Rapid hydraulic positioning speeds wheel positioning . . . reduces operator fatigue.

Internal Fixture Swings Down

Swinging bracket fixture lowered easily to grinding position . . . no belts to adjust.



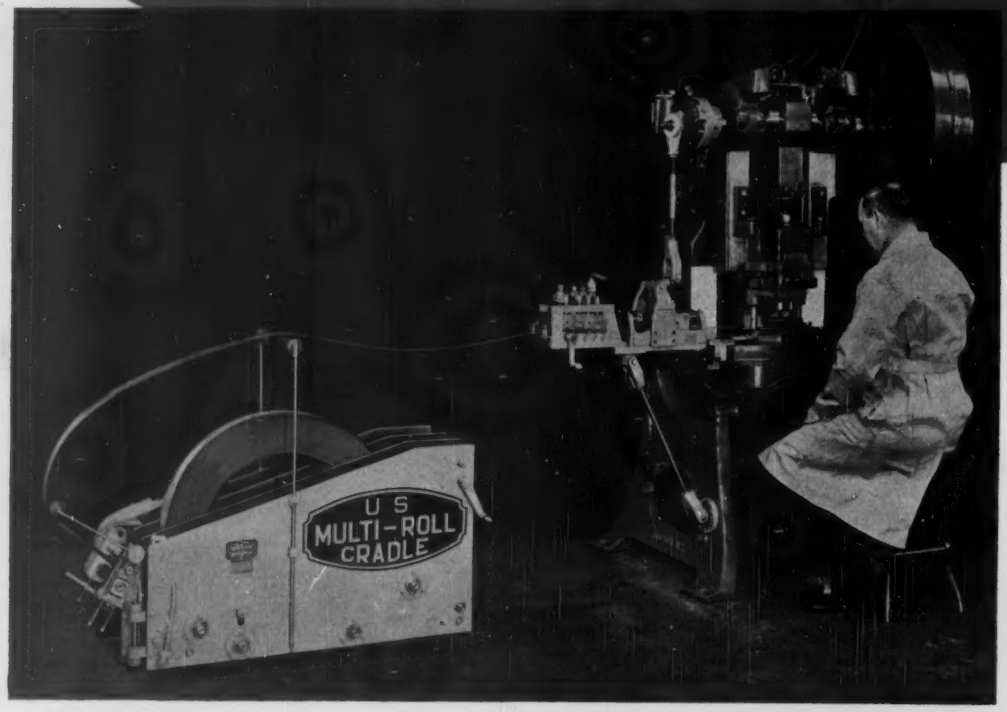
Hole is Ground—Work Piece Finished!

LANDIS TOOL COMPANY

WAYNESBORO, PENNA., U. S. A.

For maximum press room efficiency . . .
For controlled unwinding of all types of stock in coils . . .

THE U. S. MULTI-ROLL



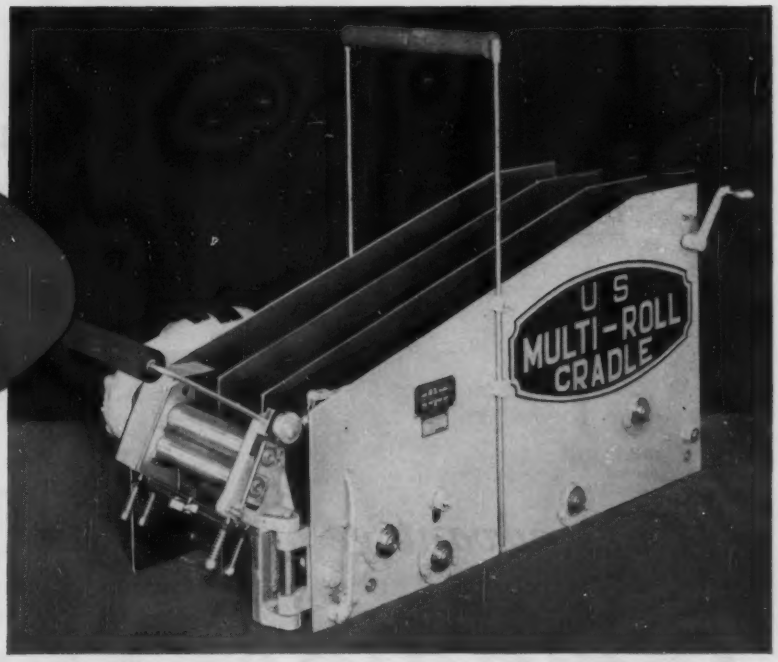
MAKES ANY PRESS AUTOMATIC!

Above: U. S. Multi-Roll Cradle Model ACC-1-9C, with four power-driven rest rolls plus a pair of power-driven take-out rolls. A geared motor of 1/3 H.P., 155 R.P.M. gives output speeds up to 80 feet per minute. For special applications other motors can be provided. The cradle will handle stock up to 1/8 inch in thickness, 9 inches in width, and coils with OD up to 40 inches. Photo shows Multi-Roll Cradle set up with a U. S. Stock Straightener and a U. S. Slide Feed to make the press completely automatic.

FAST, EASY LOADING!

Right: In the smaler sizes, coils of stock can be easily rolled into the cradle by one man. During the loading the take-out roll assembly is released by a trigger latch and swung to the side. It snaps securely into place when swung back into operating position.

CRADLE



Multi-Roll Cradle, Model ACC-1-9C, equipped with four power-driven rest rolls arranged in an arc to equalize weight distribution, plus a pair of power-driven take-out rolls. Also available as shown below right without take-out rolls.

With the U. S. Multi-Roll Cradle you get the fullest benefits from the advantages of using stock in coils. It has been designed to unwind stock in a steady, smooth run under complete control at all times. This is accomplished with four power-driven coil rest rolls mounted in self-aligning bearings and arranged in an arc to equalize weight distribution. In addition, on Model ACC-1-9C, further power is provided by a pair of power-driven take-out rolls to completely unwind coils which have a tendency to sag or slip when rest rolls only are used. Both sets of rolls are actuated by a loop control arm which operates through a micro switch. The stock can pass over the roller or press against it; either way, the feed to the press is positive and constant, and can be adjusted to rates up to 80 feet per minute. When handling some types of coils the power-driven take-out rolls may not be required, and the cradle can be purchased with the four power-driven coil rest rolls only (Model ACC-1-9NT.) On this unit the take-out rolls can be added later if needed.

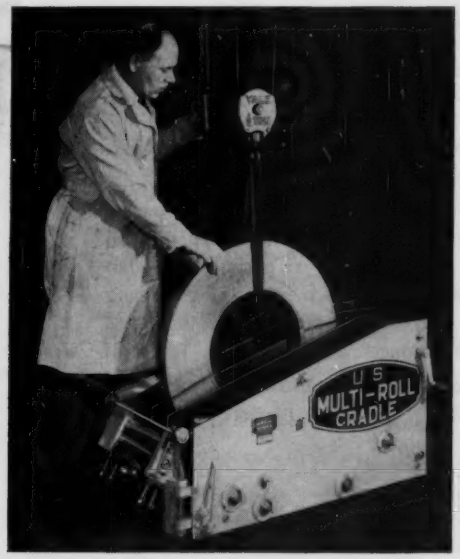
The U. S. Multi-Roll Cradle is designed for easy and rapid coil loading, and the compactness of the frame and the controlled unwinding feature make it possible to set it up close to the press for most economical and safe use of floor space.

Get full details and specifications of the U. S. Multi-Roll Cradle in Special Bulletin No. 90-M. Write for your copy today.

THE U. S. TOOL COMPANY, Inc.

AMPERE (East Orange), NEW JERSEY

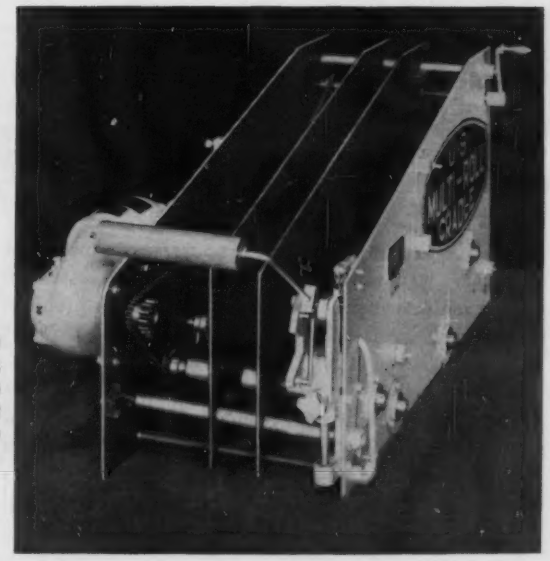
Builders of U. S. Multi-Slides—U. S. Multi-Millers—U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories



OVERHEAD LOADING!

Left: If the use of an overhead crane is preferred, it is easy to lower the coil between the two inner adjustable frames. Take-out roll assembly remains in operating position.

Right: Model ACC-1-9NT with four power-driven rest rolls only. This unit is designed so that power-driven take-out rolls can be added at any time.



Now... modernize your grinding operations without draining away your capital!

Take advantage of the Norton Grinding Machine Lease Program

for low-cost leasing of new Norton grinders and lappers

Naturally, you want to meet competition on at least equal terms — with the latest and best in modern grinding equipment.

Yet, like so many other manufacturers, you may want to conserve your working capital — and so the cost of replacing inefficient producers is delaying, if not prohibiting, your modernization.

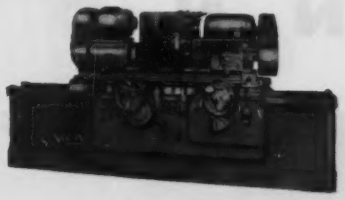
What's the answer?

The answer is the Norton Grinding Machine Lease Program, developed to help manufacturers secure the grinders and lappers they need for modernization — without weakening their financial position.

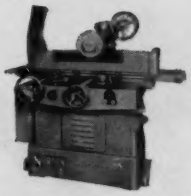
The new Norton Program gives you three separate plans for leasing new Norton grinders and lappers, with payments extending over a seven-year period. Each plan meets specific requirements. Each plan is extremely flexible, providing for early termination of the lease, or purchase of the equipment, at your option.

One of these plans may help pave the way to better business for you. Don't miss getting complete facts on them — send in the coupon!

This folder tells you how you can **pay for Norton machines while they're building your profits!**

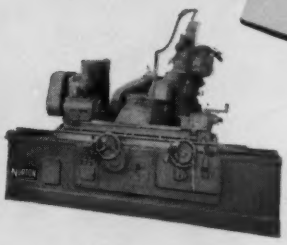


10 x 36" Type CTU Semiautomatic Cylindrical Grinder

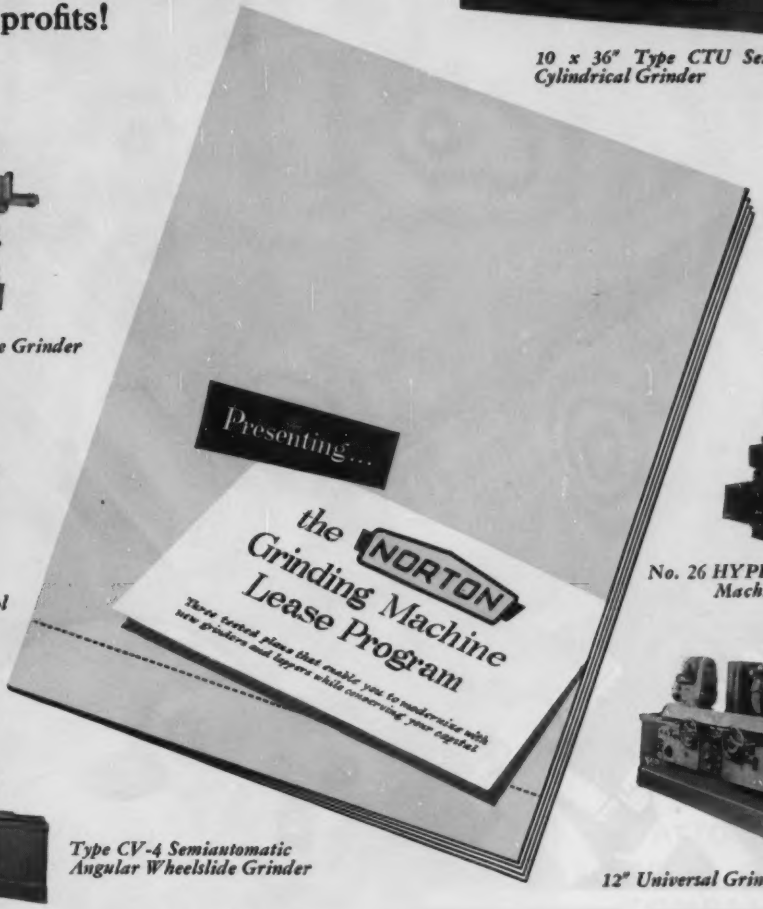


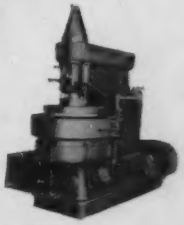
8" Hydraulic Surface Grinder

No. 20 Cutter and Tool Grinder



Type CV-4 Semiautomatic Angular Wheelslide Grinder


Presenting...
the NORTON Grinding Machine Lease Program
Three tested plans that enable you to modernize with new grinders and lappers while conserving your capital



No. 26 HYPROLAP Lapping Machine*

12" Universal Grinder

Under the Norton Grinding Machine Lease Program the machines illustrated here—and many more — are now available to you, under low-cost, flexible leasing arrangements.

This folder describes the Program giving details of the three different plans by which you can improve your competitive position and profits. Send for it now — and remember: only Norton brings you such long experience in both grinding machines and grinding wheels to help you produce more at lower cost.

To Economize, Modernize With **NEW**

NORTON

GRINDERS and LAPPERS

Making better products . . . to make your products better

District Sales Offices: Worcester • Hartford
New York (Teterboro, N. J.) • Cleveland • Chicago • Detroit

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

NORTON COMPANY, *Machine Division*
Worcester 6, Mass.

A

Please send me your folder on the Norton Grinding Machine Lease Program.

Name.....

Title.....

Company.....

Address.....

City.....*Zone*....*State*.....

For more information on products advertised, use Inquiry Card, page 241

ANNOUNCING

BALANCED *Action* GAGES

CALL YOUR
WINTER
DISTRIBUTOR

Now available through Winter Distributors—a complete line of standard Plug and Ring Gages, threaded and plain. These Winter Gages, like Winter Taps, are manufactured with extreme care. The Winter Brothers principle of "Balanced Action" means the utmost in accuracy. Catalog on request.

WINTER BROTHERS COMPANY, Rochester, Michigan, U. S. A.

Distributors in principal cities. Branches in New York • Detroit • Chicago • Dallas
San Francisco • Los Angeles • Division of National Twist Drill & Tool Co.

National

For your punishing metalcutting operations . . .

Long-wearing cutting edges

Reaming, counterboring, and spotfacing call for sturdy tools. It's the cutting edge that does the work.

Use Nationals.

They give you the edge.

NATIONAL TWIST DRILL AND TOOL COMPANY

Rochester, Michigan, U. S. A.

Distributors in principal cities. Factory Branches: New York • Detroit • Chicago Dallas • San Francisco • Los Angeles

CALL YOUR NATIONAL DISTRIBUTOR

NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH. U.S.A.

WOULD YOU SPEND

for all the production you can get from this new 10hp No. 2 Model CK universal milling machine? That's all it would cost you under...

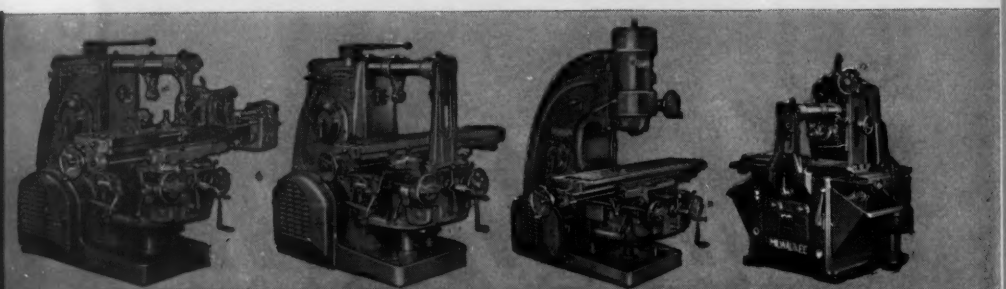
For additional data on this machine, see our catalog in Sweet's.

Kearney & Trecker's

TOOL-LEASE

PROGRAM

Kearney & Trecker manufactures a complete line of more than 250 standard knee and bed type milling machines and precision boring machines.

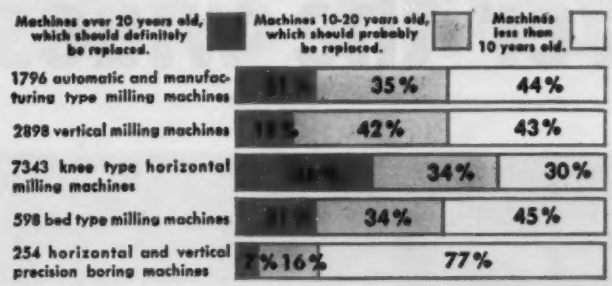


Universal Mills | Plain Mills | Vertical Mills | Production Mills

47½ CENTS PER HOUR

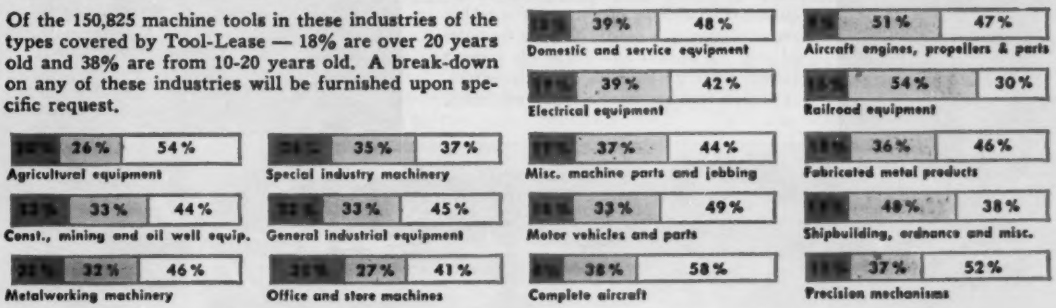
LET'S LOOK AT THE OBSOLESCENCE PICTURE IN THE SPECIAL INDUSTRY MACHINERY FIELD

Includes machines for food-products, textile, woodworking, paper industries, printing, glass-making, cement-making, incandescent lamp-making; paint-making, rubber-working, tobacco-products, shoe-making, and stone-working; smelting and refining equipment. Of the total 12,889 machines in use today which can be replaced by Tool-Lease equipment — 28% are over 20 years old, over 36% are 10 to 20 years old!



HERE'S THE OVERALL PICTURE IN THE ABOVE AND 15 OTHER BASIC INDUSTRIES

Of the 150,825 machine tools in these industries of the types covered by Tool-Lease — 18% are over 20 years old and 38% are from 10-20 years old. A break-down on any of these industries will be furnished upon specific request.



Figures adapted from 1953 American Machinist survey of metalworking industry

HERE'S another popular knee-type universal milling machine, packed with outstanding design and operating features. It's available for your immediate needs under Kearney & Trecker's Tool-Lease program.

Under Tool-Lease Plan "A," one of three seven-year lease agreements offered by Kearney & Trecker, you make two semi-annual rental payments, totaling 25% of the machine's price during each of the first three years. Actually in dollars and cents, you pay 47½ cents per hour for this new 10 hp No. 2 Model CK universal milling machine. That means a machine installed in your plant and in operation — *literally for pennies an hour!*

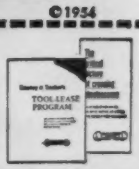
What's more, under Tool-Lease, you can rent any of over 250 different types and sizes of standard milling machines or precision boring machines. All are available under three basic plans, with varying options to continue or terminate the lease, or to purchase the equipment. If you require special machinery or heavy-duty CSM bed types, special agreements will be considered.

For complete information on Tool-Lease, see your Kearney & Trecker representative or mail coupon to Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.

©1954

KEARNEY & TRECKER CORP.
6784 W. National Ave., Milwaukee 14, Wis.

Please send me Bulletin TL-10A on Tool-Lease Program and booklet titled "Critical Picture of Creeping Obsolescence."



Name.....

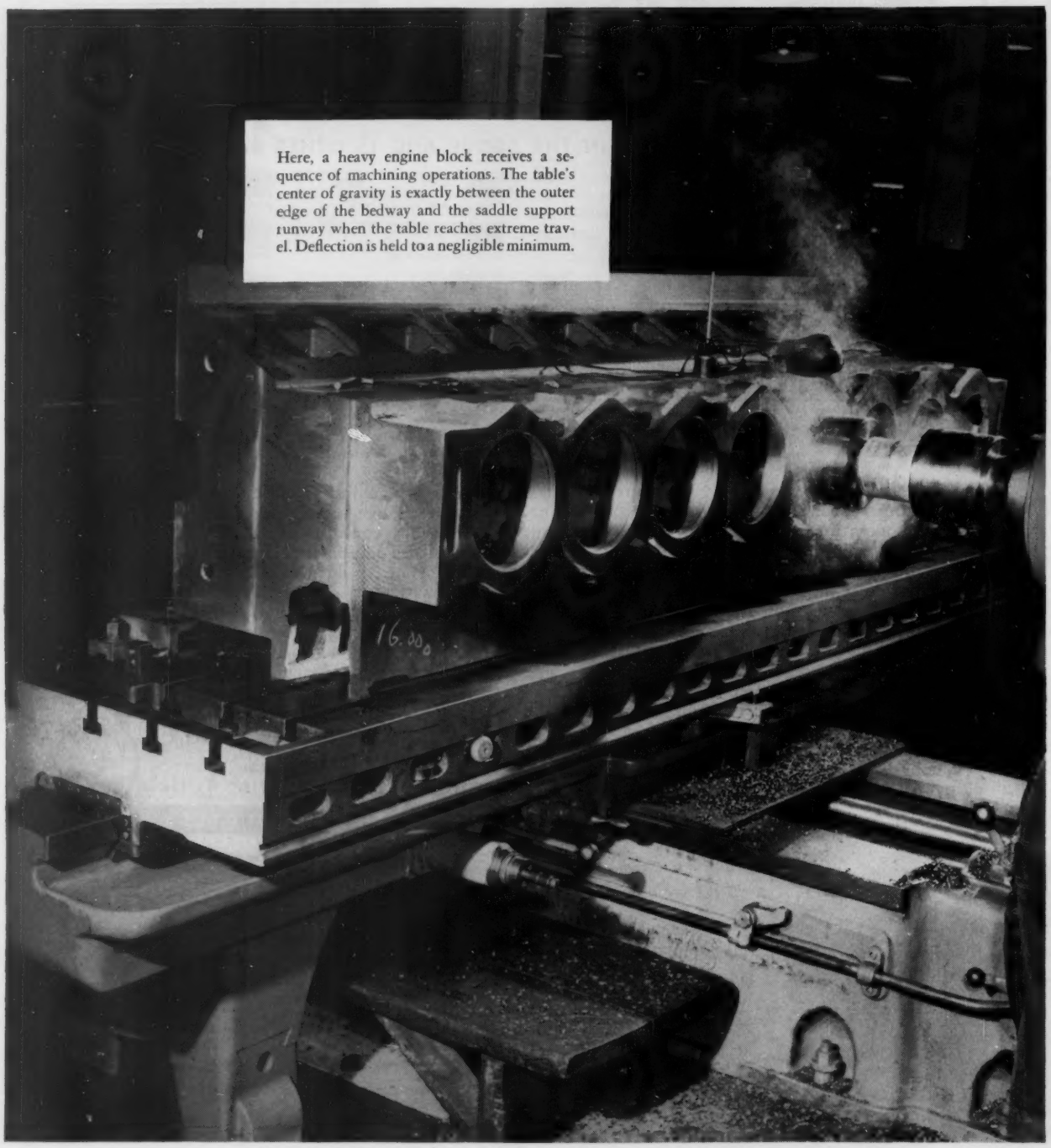
Title.....

Company.....

Address.....

City.....Zone.....State.....

G&L 30 Series offers over the widest working



Here, a heavy engine block receives a sequence of machining operations. The table's center of gravity is exactly between the outer edge of the bedway and the saddle support runway when the table reaches extreme travel. Deflection is held to a negligible minimum.

you greatest precision ranges...HERE'S PROOF

Extended saddle, saddle supports and auxiliary runways are available with G & L 30 Series Table Type Horizontal Boring, Drilling and Milling Machines. This exclusive method of supporting the table takes the risk out of precision-machining large workpieces requiring full range of the machine.

A *fully-supported,* extended saddle is absolutely vital when a long table and high columns are used to precision-machine a sequence of different surfaces on a heavy workpiece. The G&L design incorporates an extended saddle that minimizes deflection and is provided with full support even when the table is at its outermost travel limits.

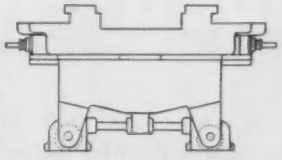
What's more, G&L has engineered a system of concentric leveling (see lower right) which insures perfect alignment and parallelism between rails, saddle supports, saddle and table.

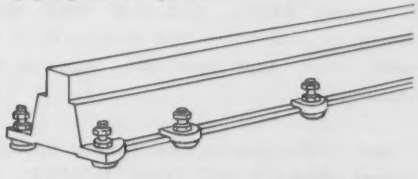
These are only a few of the many advantages you get with a modern G&L Horizontal. A selection of many other standard and optional features gives you the exact machine you need — a machine that's unsurpassed for accuracy, capacity, simplified operation and years of outstanding performance.

For complete details, see your G&L representative or write for catalog No. 30.

G&L 30 Series machines are available in two basic models — the 350-T (shown) with a 5" spindle and 25 hp, and the 340-T with a 4" spindle and 20 hp. Note how the under-the-floor runways allow the operator to perform his job without having to climb over the machine.

Adjustable brackets with hardened and precision-ground steel rollers. Located one to each support leg, they engage hardened and ground steel rails, are protected by spring-loaded wipers.





On runway, large diameter adjusting screws are threaded through flange and drilled to receive foundation bolts. Rails are sunk into foundation so tops are even with floor level. Rails and machine are separately leveled and saddle support brackets adjust independently.

Builders of the world's finest heavy-duty machine tools — Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Openside Planers; Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools.

GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

ARMSTRONG

More Tools Per Man for More Profit

Even when labor was cheap and tools were costly, it was the best tooled shops that prospered. Now, with wages higher and the work days shorter, it becomes imperative that every worker be supplied with every tool that will increase his hourly production.

See that each lathe, planer and shaper operator has the correct ARMSTRONG TOOL HOLDERS for each operation he performs. Equip each machine with its full complement of ARMSTRONG Setting-up Tools. Use better balanced, handier ARMSTRONG WRENCHES on machines and assembly lines. Specify ARMSTRONG Drop Forged "C" Clamps and Lathe Dogs . . . Today, only quality tools can be truly economical.

Write for the ARMSTRONG Catalog. It has page after page of production-increasing, cost-cutting tools.

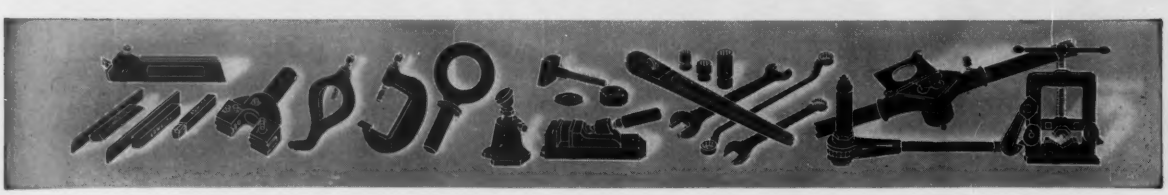
ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5213 W. ARMSTRONG AVENUE CHICAGO 30, U.S.A.

New York and San Francisco

Armstrong Tools are Stocked by Industrial Distributors



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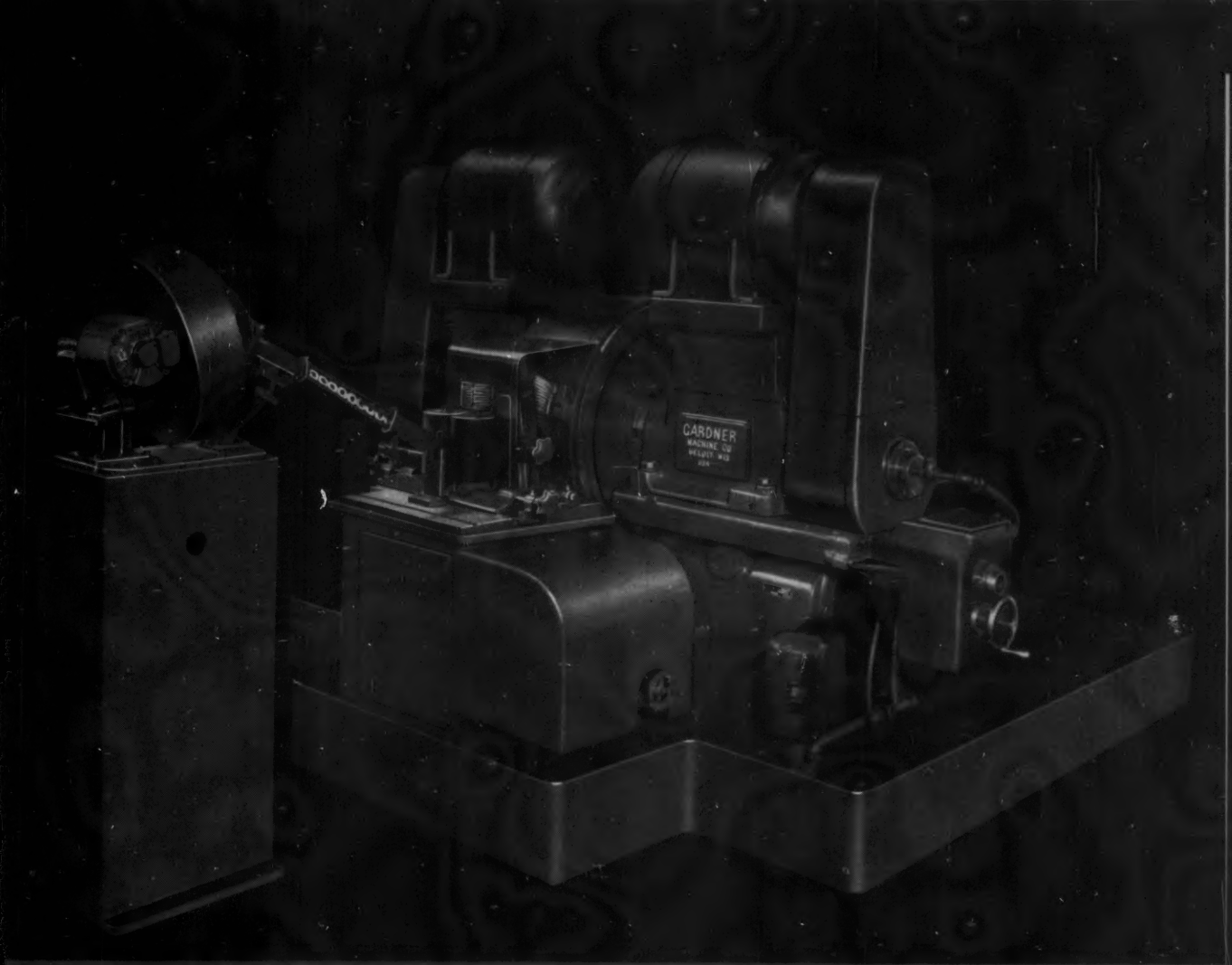
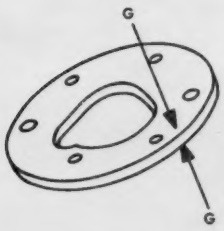


Grinds 9000 Surfaces per Hour



TWO parallel sides of thin plates ground in ONE operation

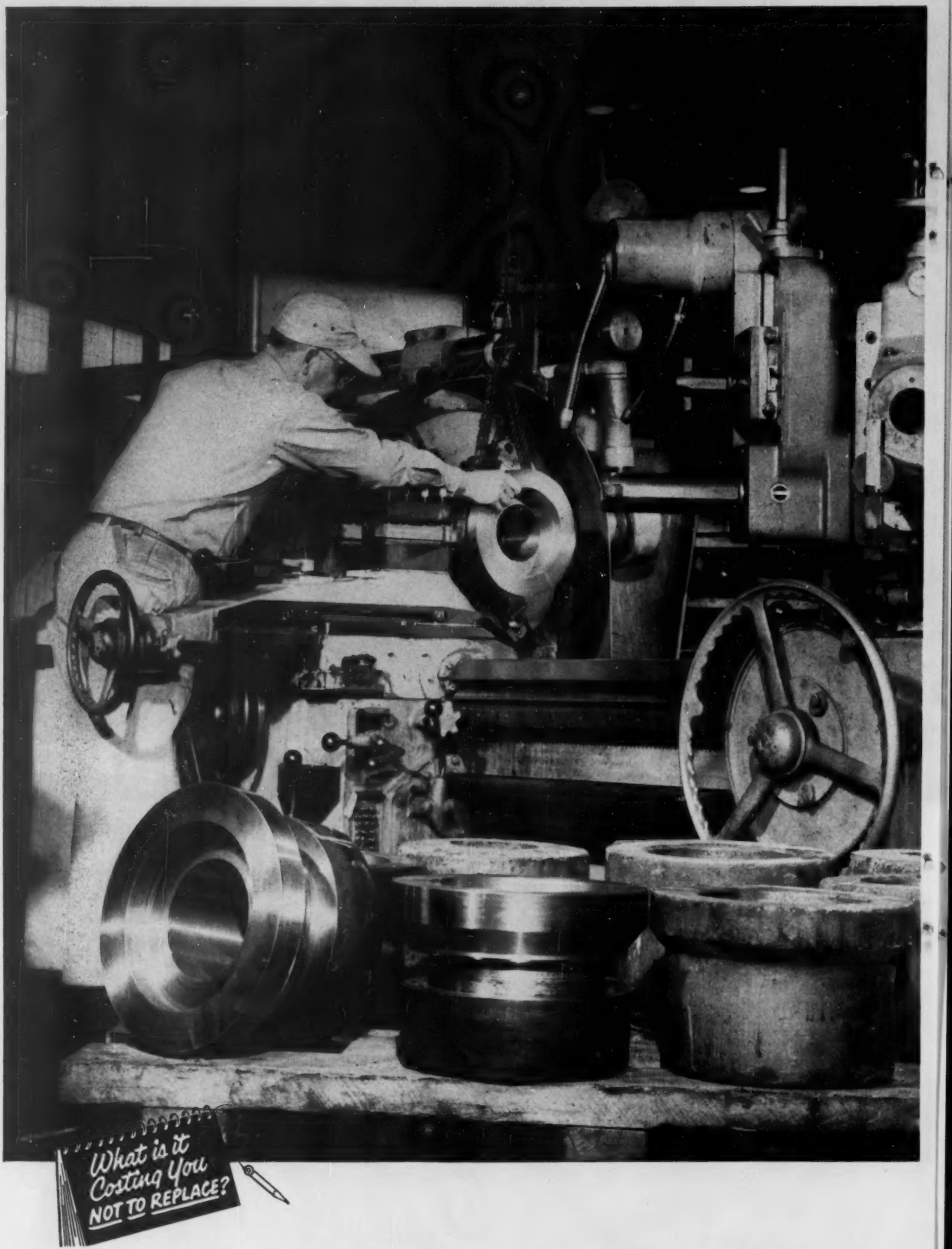
Job Data	
MACHINE	Gardner No. 125-26" Double Spindle Grinder.
TOOLING	Motor-driven hopper feeder and power-operated feed-thru rolls.
PART	Aluminum time fuse plate.
PRODUCTION	4500 per hour, both sides.
STOCK REMOVAL	.015" overall.
TOLERANCES	.0003" to .0005" for parallelism; .0015" for uniformity.
ABRASIVES	2 Gardner Yellow-Rim WIRE-LOKT Discs.

GARDNER

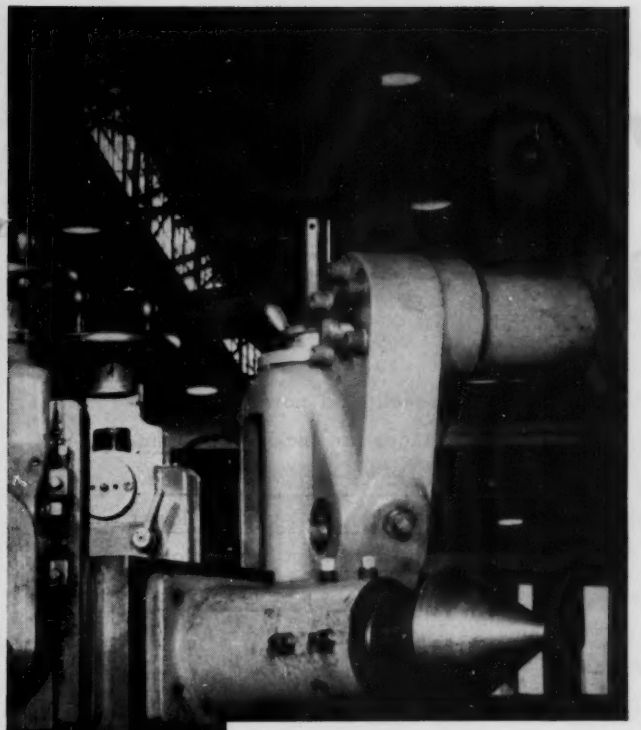
precision disc grinders

Beloit, Wisconsin, U. S. A.

139M



YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER &



Here's a good example of what happens when a part is machined on the *right* machine with the proper tooling!

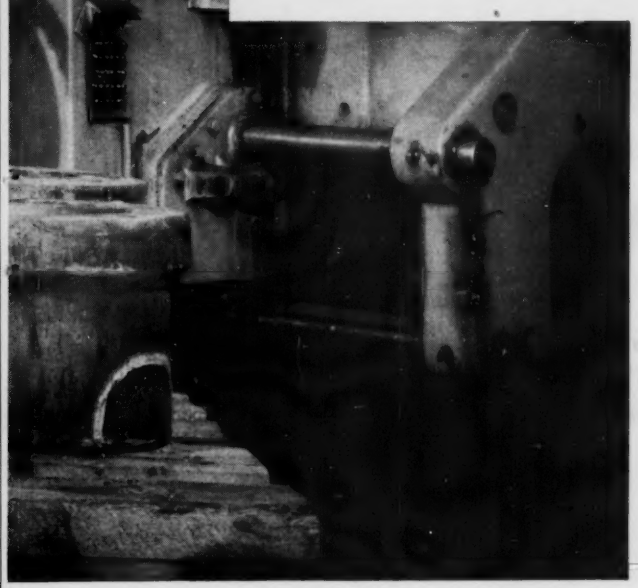
The machine was a new Warner & Swasey 4-A Turret Lathe installed in 1953 at the Emsco Manufacturing Company plant at Houston, Texas. It replaced an 8-year-old saddle type turret lathe.

Previous time for machining a large steel forging was 1 hour 54 minutes. This involved boring a hole to .001" tolerance, facing the end, a two inch turning operation on the 11" O.D., single pointing a 30° angle two inches long, grooving a 1½" wide square groove on the O.D., and breaking the corners.

After the job was transferred to the new Warner & Swasey, and following the setup and tooling recommendations of our Field Engineer, *the operation was completed in 30 minutes!*

Another operation transferred to this Warner & Swasey was machined in one-fourth the previous time! On a third part the operator produced 13 hours' work in one shift!

Machining time cut from 1 hr. 54 min. to 30 minutes!



Translating these time savings into production, Emsco reports that production of parts transferred to the Warner & Swasey has been increased by 32%. Operators like the machine's ease of handling and its ability to hog off metal.

This is a record of just one machine, but it emphasizes the profit possibilities open to you when the job is done on the *right machine,* properly tooled, and job-analyzed by a turning specialist . . . a Warner & Swasey Field Engineer. Call him in on your replacement problem. He's a good man to work with.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

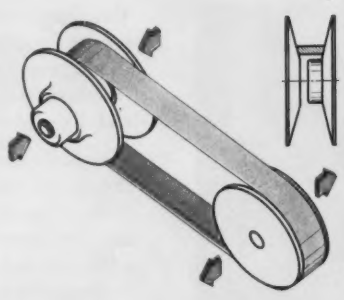
They have what it takes

to reduce your centerless grinding

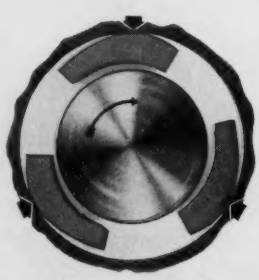
During the past 33 years, Cincinnati has been building the world's finest line of centerless grinders; analyzing centerless requirements for customers; tooling up the machines for low-cost production. All these years of experience in centerless design and application has gone into the new No. 2. You will find it more accurate, more versatile than ever before. Time-proved Cincinnati advantages have been retained . . bed-rock grinding wheel spindle mounting; FILMATIC grinding wheel spindle bearings; lower slide construction for workrest; simplified method of truing regulating wheel. And now these additional advantages are included . . infinitely variable regulating wheel speeds; pre-loaded, precision ball bearing lower slide; pressure lubrication of regulating wheel spindle bearings; stabilized infeed screw. ¶ Of course, many more features desired by centerless grinder users are incorporated in the new CINCINNATI FILMATIC No. 2 Centerless Grinder. Would you like to know more about them? Write for new catalog No. G-644.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

Regulating wheel truing controls; a five position lever, and a rate selector knob are conveniently located. (Optional equipment at extra cost.)



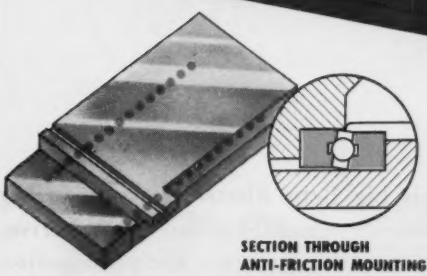
Smooth regulating wheel drive through variable pitch sheaves; infinite number of speeds, handwheel selected and tachometer indicated.



FILMATIC grinding wheel spindle bearings are still the best in the machine tool industry; no fuss, no bother.

CINCINNATI

costs



SECTION THROUGH ANTI-FRICTION MOUNTING

Precision anti-friction slide under regulating wheel unit; split-hair dial adjustment is translated precisely to infeed movement.

NEW CINCINNATI FILMATIC No. 2 CENTERLESS GRINDER

Write for complete details. Catalog No. G-644.

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

BIGGEST!

This Betts 100 Inch Worm and Rack-driven Slotter is the largest ever built in America.

It is more than 30 feet high and weighs over 140 tons.

The table has a load carrying capacity of 75 tons and the bed measures 9 feet across the ways.

Seventeen motors are required for its operation.

This big Betts Slotter has a reversing planer-type variable-voltage motor drive. All machine functions are push button controlled and the circular work table has General Electric ultra-precise electronic indexing.

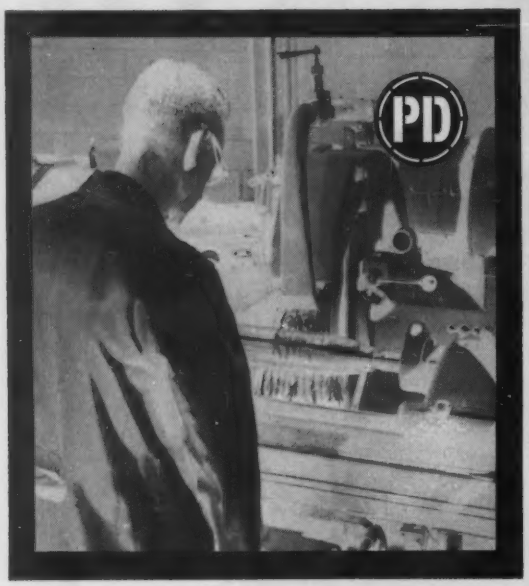
CONSOLIDATED MACHINE TOOL

Wholly owned subsidiary of Farrel-

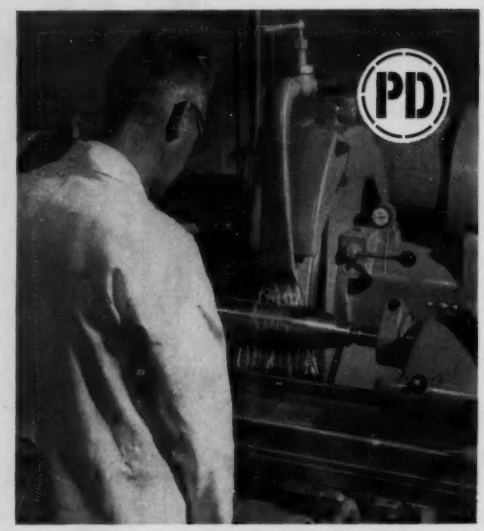
CORPORATION, ROCHESTER, N.Y.

Birmingham Company, Incorporated.

A remarkable development that can save you money



Just as a NEGATIVE guarantees you an exact duplication of a photograph each and every time, you are always assured a . . .



. . . POSITIVE DUPLICATION of an original grinding wheel each and every time through the CINCINNATI (PD) Manufacturing Process.

NOW!

Cincinnati Grinding Wheels offer

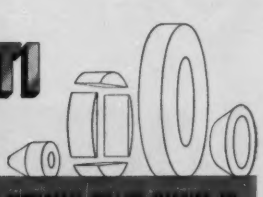
PD Positive Duplication

Positive Duplication is the most talked about grinding wheel development in years. And it's important to *you,* for this achievement in precision manufacturing and quality control can *save you money* . . . and *increase your production!*

Through the CINCINNATI (PD) Manufacturing Process you are assured a Positive Duplication of the original wheel *every* time you reorder. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will *act and grind exactly alike. Yet they are priced no higher than ordinary wheels.*

Let us prove to you how CINCINNATI (PD) WHEELS can save you money and increase your production. Just contact us and we'll send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

CINCINNATI
Grinding Wheels



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Why CIMCOOL wins by two big points . . .

First, because CIMCOOL°—the radically new and different cutting fluid—*lowers costs*. Second, this revolutionary coolant *does a better job*.

Naturally CIMCOOL takes home the trophy. It's a *chemical emulsion*. It replaces all water emulsions and all but a few highly compounded specialty oils. It permits faster speeds and increases tool life because it combines friction reduction and cooling capacity in a degree never before attained. It's longer lasting in machines, so CIMCOOL reduces downtime and cuts labor costs for cleaning and changing.

For a demonstration of how CIMCOOL can score a field goal from every angle, just write us. We'll have one of our Cincinnati Milling-trained machinists call on you —without cost or obligation. Or, if you prefer, write for our free booklet, "Cimcool Defeats Heat." Address Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.

CIMCOOL

for 85% of all metal cutting jobs

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

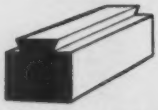
Never Confuse the No. 8 MARVEL with an ordinary Band Saw

...only the MARVEL is Universal

Only on a MARVEL No. 8 does the blade remain at a right angle throughout its full 18" feed traverse. Work always remains stationary.

Only on a No. 8 MARVEL can the saw column be instantly indexed and locked at any angle from 45° right to 45° left, and the saw then fed thru the work at the desired angle — without moving the work.

Only a No. 8 MARVEL can do all of these things: Snip-off a ⅛" rod or cut-off an 18" x 18" cross section



Rough to Size and Shape

Miter

Index

cut off and shape Structural Beams.

Only a No. 8 MARVEL has the large T-slotted work table, with removable quick action vise, that permits accurate set-ups of work of unrestricted sizes and shapes, special fixtures; Etc.

"Rough Machine" to size and shape with minimun chip waste

The No. 8 MARVEL is the "busiest tool in the shop" wherever installed because it is a *universal* tool—has both the capacity and the versatility to handle not only standard sawing jobs but innumerable "trick" and convenience jobs as well. More than a metal saw, the No. 8 MARVEL is a fine machine tool with machine tool features like: Both power and hand feeds; Depth Stops; Automatic Blade Tension; Built-in Coolant Pump; Three operating speeds (or six with 2-speed motor). Moisture-proof electrical controls that conform to both "J.I.C." and "MACHINE TOOL" electrical standards; Dirt-proof ball bearings, etc.

If you cut, machine or fabricate metal; this is a sawing machine you should know about. Write for catalog.

MARVEL Metal Cutting SAWS

Better Machines-Better Blades

ARMSTRONG-BLUM MFG. CO. • 5700 West Bloomingdale Avenue • Chicago 39, U.S.A.

For more information on products advertised, use Inquiry Card, page 241

Production Pointers from GISHOLT

GISHOLT TIME-SAVING IDEAS

Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help you cut time and costs in your own work.

SHORT STROKES ON IDLE STATIONS PAY OFF WITH LONG SAVINGS

This Fastermatic Feature Saves both Cycle Time and Changeover Time

Here, the Gisholt 2F Fastermatic Automatic Turret Lathe is fully tooled for *both* machining operations on these steel gear forgings. For the first operation, tools on hexagon turret stations 1, 2, 4 and 5 are used. Tools on the front and rear cross slides face and chamfer.

When first operation machining on a lot is completed, tools already on hexagon turret stations 3 and 6 are ready for the second operation. This is possible because of the short stroke cam arrangement, a standard Fastermatic feature, which reduces travel of the hexagon turret saddle. This moves forward only far enough on idle stations to reset the indexing mechanism, saving 4.2 seconds per station.

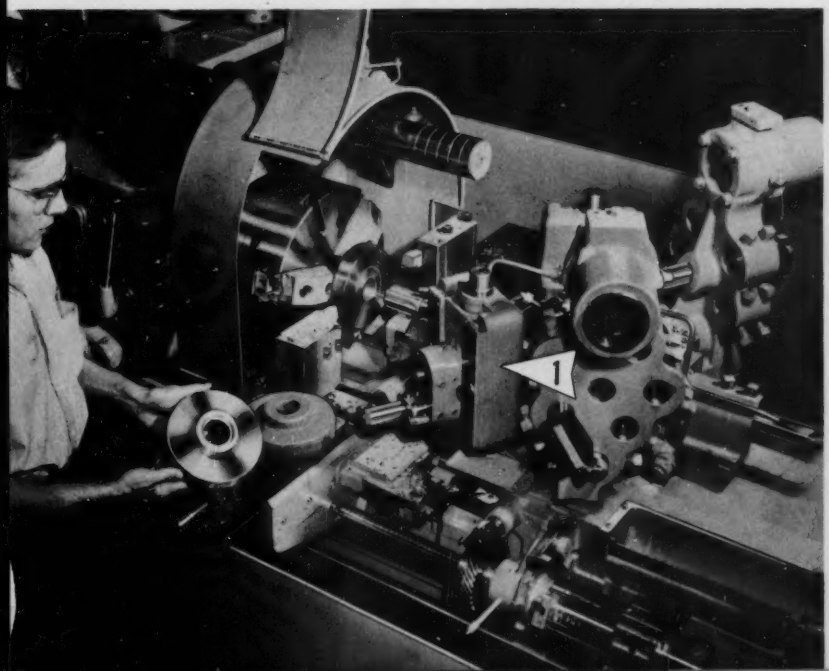
Changeover is a push-over

For the second operation, the short stroke cams operate on hexagon turret stations 1, 2, 4 and 5. Front and rear cross slide tools are changed. The chuck gets soft jaws which are bored and faced "in place" from hexagon turret station 6.

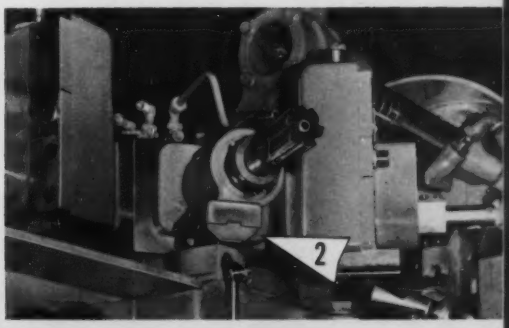
Tools on hexagon turret stations 3 and 6 and on the cross slides complete the part. Time for first operation is 3.30 minutes f.t.f., and for the second, only 1.39 minutes.

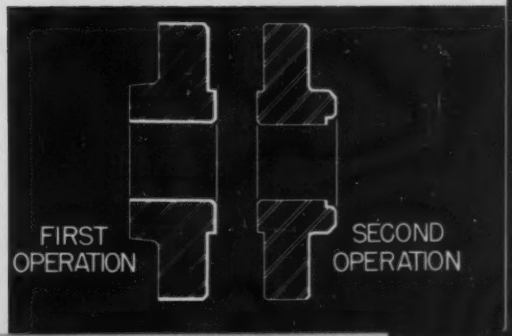
The standard short stroke arrangement reduces traverse time on all idle stations, and permits leaving second operation tooling in place on the hex turret for jobs like this.

1st operation setup. Operator holds second operation part. Adjustable boring head (1) bores and faces soft jaws "in place" and also chamfers co-bore in second operation.



To short stroke tooling on hexagon turret station facing the spindle, operating cam (2) is added. Cam is interchangeable and usable at any station.





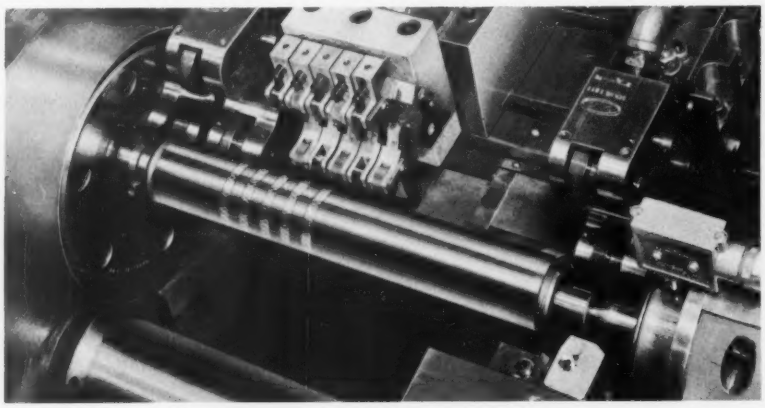
GISHOLT

TIME-SAVING IDEAS

15 SECONDS PER PART...INCLUDING THREADS

High Speed Setup for 6 sizes of grease gun barrels on Hydraulic Automatic Lathe

Setup for producing grease gun barrels shown above.



This is more than a problem of speed. Careful holding and driving are imperative. The material being worked is thin-wall welded sheet tubing.

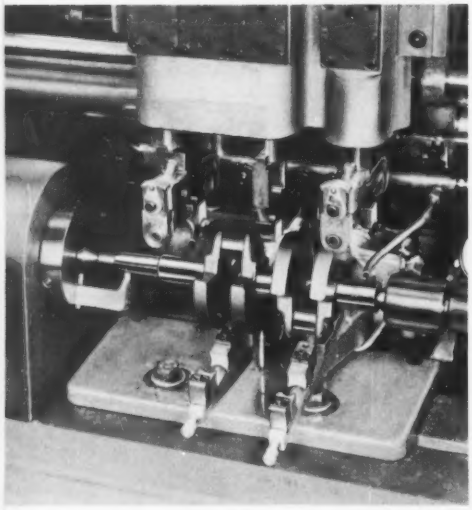
Production is handled on this one Gisholt No. 12 Hydraulic Automatic Lathe. To avoid distorting, the parts are internally supported by bushings at both ends for forming and threading. A tailstock-supported expanding mandrel drives and also equalizes chucking pressure and supports where knurling is done.

Tools on the front carriage turn the right end and form an oil seal. Tools on the rear independent slide roll the threads at both ends and perform knurling. Because knurling is done on the four larger sizes only, the knurling tool block flips back out of the way for the other two sizes.

Production is at a rate of 192 parts per hour at 80% efficiency. Workpieces range from 5" to 15" in length.

The simpler loading and faster machining provided by the No. 12 Automatic Lathe make it possible to produce 4 parts per minute.

60% MORE PRODUCTION WITH 2-IN-1 SUPERFINISHING



All bearing surfaces are Superfinished at once with this double-tooled Superfinisher. All crankshafts shown at right are done on this one machine.

Crankshaft main & pin bearings Superfinished at once

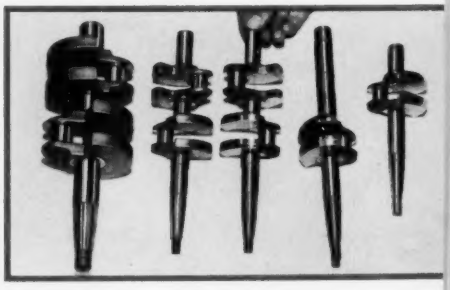
By keeping abreast of new developments, West Bend Aluminum Company, Hartford, Wisconsin, now Superfinishes outboard motor crankshafts 60% faster than before. This Gisholt Model 51A Superfinisher is tooled to Superfinish simultaneously both main and pin bearings on a variety of crankshafts.

With the workpiece loaded, the operator attaches follower-type stoneholder arms to the pin bearings. Pressing a button starts the cycle.

Two, three or four stone-carrying quills Superfinish the main bearing surfaces while the follower-type stoneholder arms do the pin bearings.

Time is only 35 seconds f.t.f. and bearing surfaces are Superfinished from 30 to 40 micro-inches down to 10 to 15 micro-inches RMS. This *controlled* 10 to 15 micro-inch "frosty" finish holds oil and eliminates the need for "breaking in" bearing surfaces. Grinding marks are removed and all amorphous smear metal scrubbed away.

In this interesting setup, both main and pin bearings are Superfinished in one operation, thus saving time and money to produce a product that performs better, lasts longer.



Superfinish has made great strides in the past few years. This and many other interesting jobs are shown in the new Superfinish catalog, form No. 1169. Write for your copy.

GISHOLT

TIME-SAVING IDEAS

HOW TO MACHINE CAST IRON AND STEEL AT SAME TIME

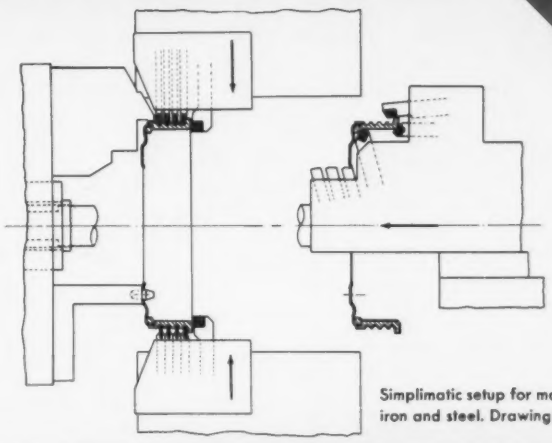
Brake drums handled fast on Simplimatic Automatic Lathe

The workpieces here are brake drums with heavy outer rims of cast iron and stamped back plates of steel. Job requirements are: (1) To do simultaneous machining of two materials, (2) produce a good finish, and (3) complete all work in one chucking.

A Simplimatic Automatic Lathe machines the drums, which are 10″ in diameter and 2⅜″ deep. Chucked on the O.D., wide swivel jaws prevent workpiece distortion. Location is against the back face and drive is through a hole in the steel web.

Carbide-tipped tools on the front and rear slides rough and finish groove and face, while tools on the center slide bore the I.D., chamfer and turn the O.D. of the cast iron rim. At the same time, three high-speed steel tools on the center slide, rough, semi-finish and finish bore the steel back plate. Three tools divide the cut and prevent flaring out of the edges around the bore.

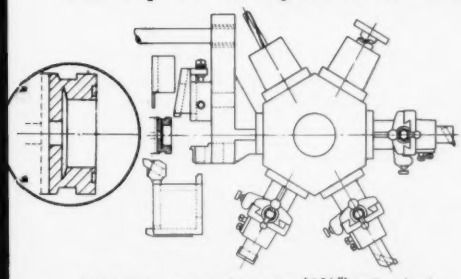
Expert tooling, smart holding and automatic production combine to give a low 1.7 minute f.t.f. time for machining these difficult two-metal parts.



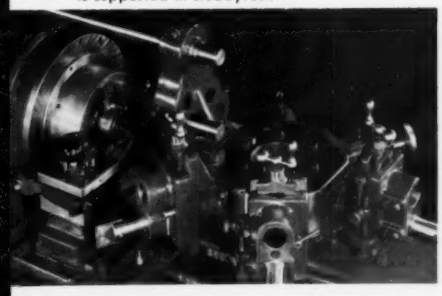
Simplimatic setup for machining drums of cast iron and steel. Drawing shows tooling layout.

SINGLE CHUCKING GUARANTEES ACCURACY OF SPLIT PARTS

Variety of workpieces handled by one Ram Type Lathe



▼ Special air-operated oversize (5¾″) collet chuck is supported in steadyrest.

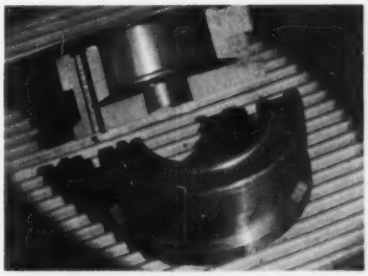


These cast iron neck-ring molds are made from stick castings which are split and ground before coming to this machine. To be certain of parallel faces and concentricity, it is important to hold to one chucking.

Here is how it's done on this Gisholt No. 5 Ram Type Turret Lathe: Standard tools on the hexagon turret core drill, co-bore and recess in the cavity, finish turn the O.D., face and groove. Square turret tools rough turn and face, form and groove. Cutoff is from the rear tool post using reverse feed on the cross slide.

Because stick castings are 16″ in length, a ball bearing steadyrest supports the work during all machining operations. Time ranges from 5 to 7 minutes f.t.f.

Parallel faces and concentricity of these divided parts are insured by completing all machining in one handling on a Gisholt Ram Type Turret Lathe.



Completed neck ring for bottle mold.

"What You Should Know About Buying and Renting Machine Tools"

This new bulletin reviews the most current and up-to-date thinking on leasing and time payment plans. Ask for your free copy of P-1173. No obligation, of course.

GISHOLT

TIME-SAVING IDEAS

CORRECTIVE MACHINING CUTS DOWN 155 MM SHELL LOSSES

Gisholt 2L Saddle Type Turret Lathe Performs Money-Saving Service

Shell production is big production. Slips are bound to occur along the line sometimes. The job of this 2L Saddle Type Turret Lathe is to make good shells out of bad ones by performing these five corrective machining operations:

Operation 1 Nose end. Face from square turret, bore and co-bore from hexagon turret.

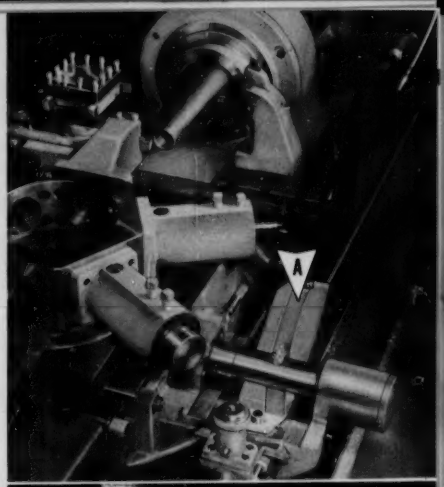
Operation 2 Ogive. Locate from nose end and turn ogive with special tool on hexagon turret governed by special taper attachment cam plate (see A).

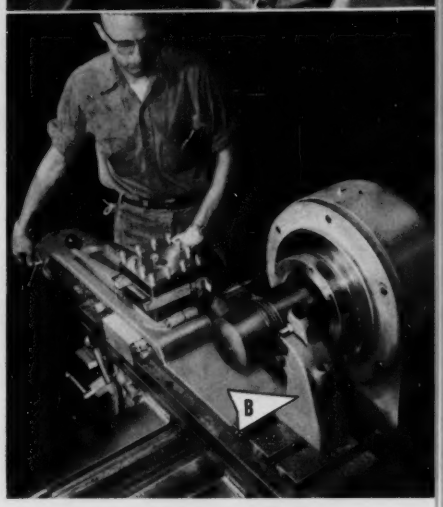
Operation 3 Base end and boattail. Face from square turret and turn boattail with square turret tool governed by special taper attachment cam plate.

Operation 4 Band groove. Machine band groove with special tool in tool holder at rear of bridge-type cross slide (see B).

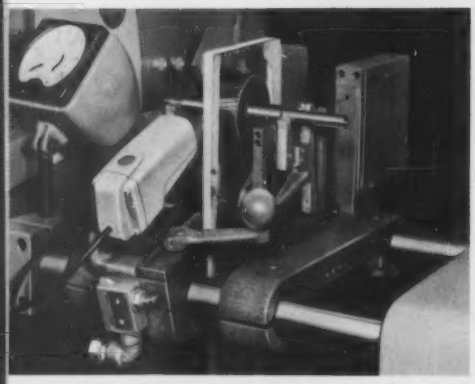
Operation 5 Form band. A special form tool in tool holder at rear of bridge-type cross slide forms band.

This standard saddle type lathe equipped with cross-feeding hexagon turret and bridge-type cross slide meets all shell salvage requirements.





AND NOW, STILL MORE SPEED IN PRODUCTION BALANCING



Lever raises or lowers work-driving belt and starts or stops Balancer for simpler, faster loading.

No. 1-255

634

Loading and Starting of Balancer Made Faster by Double-working Attachment

These armatures are dynamically balanced to low tolerances on a Gisholt 1S DYNETRIC Balancing Machine at a very rapid pace. Yet, a further step-up in speed has been made by the use of a belt lifter attachment.

One easy movement of the hand lever raises the work-driving belt to clear the work or bearings for loading and unloading, and at the same time actuates a micro switch to start or stop the machine drive motor. This simple device pays off very well.

This belt lifter attachment combines with the direct-reading amount meter and other Gisholt Balancer features to attain even higher production speeds for accurately balanced parts.

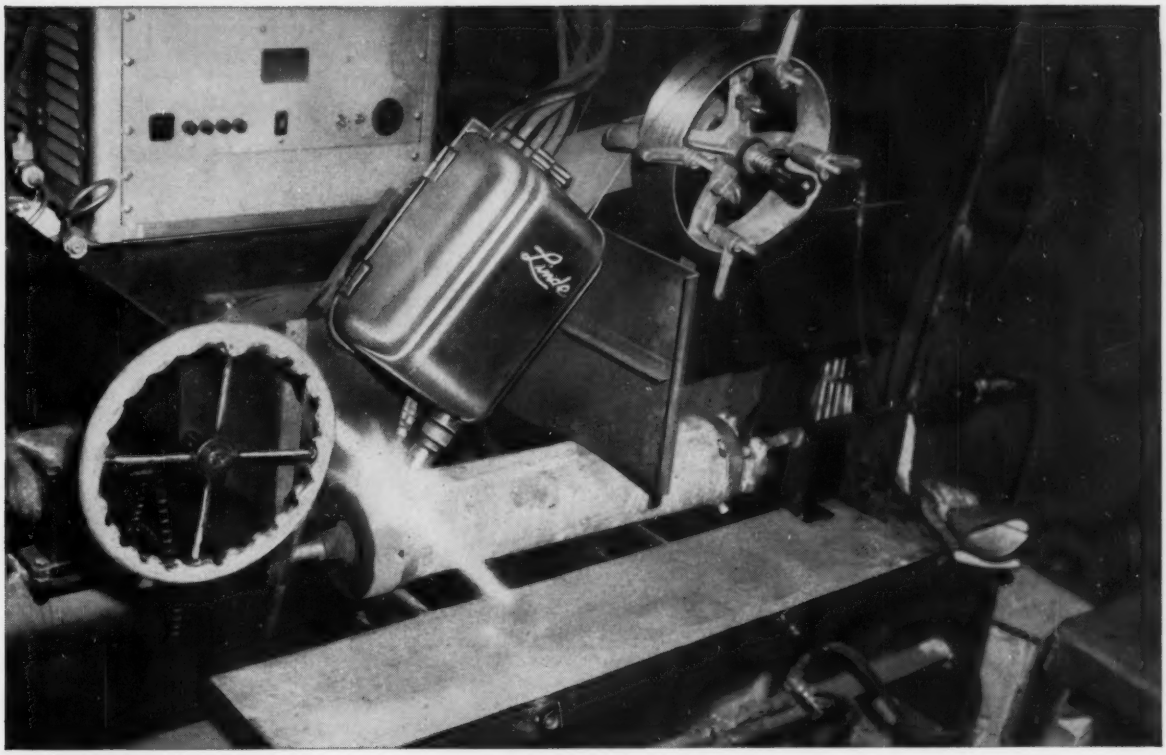
Balancing School, the only one of its kind, is offered by Gisholt. Covers all phases of this important subject. Write for complete details.

DYNETRIC BALANCERS

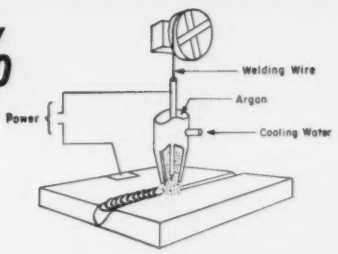
THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



Sigma Welding...Cuts Costs 36% Ups Steel Fabrication 93%



By shifting from manual arc welding to mechanized sigma welding, production of 31-in. long, 11-ga. steel condensers was almost doubled—costs were cut over a third—and unit quality greatly improved. These sigma welded condensers have been tested to hydrostatic pressures of 2,800 lb. per sq. in. with no sign of failure.

All completed condensers are subject to an air pressure test under water, and a supersensitive electronic leak detector . . . Rejects have been practically eliminated by sigma welding. Like many other products throughout industry, these condensers are being fabricated faster and more economically than ever before. Here are some sigma welding features—

- Uses any standard d.c. or constant potential power supply. With c.p., no control is necessary to maintain constant arc voltage, starting is faster and operations more efficient.
- Makes smooth welds in all type joints—on all commercially fabricated metals.
- Welding speeds exceed 100-in. per minute in many operations . . . And sigma welding joins metals up to ¼-in. thick in one pass. Start saving now, call your local LINDE representative for more information—and ask for Form 7942 "Modern Methods of Joining Metals."

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SEVENTY FIFTH
1880 BULLARD 1955
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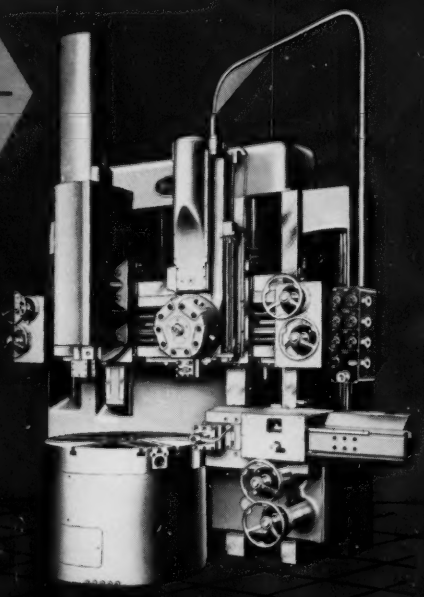
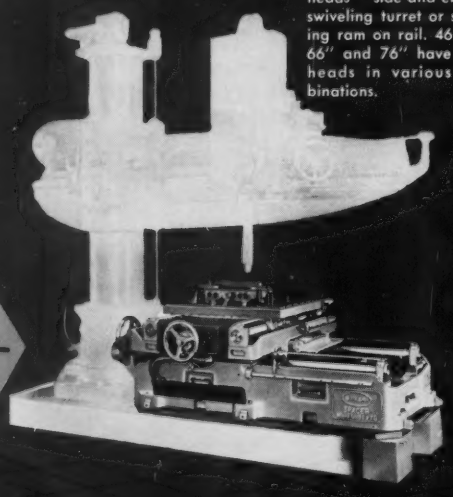
CUT MASTER V. T. L., Model 75

In six sizes, 26"-36"-46"-56"-66" and 76". The 26" and 36" sizes have two heads — side and either a swiveling turret or swiveling ram on rail. 46"-56"-66" and 76" have three heads in various combinations.





SPACING TABLE

30x20, mounted on super service drilling machines or 4'-5' and 6' radial drills.

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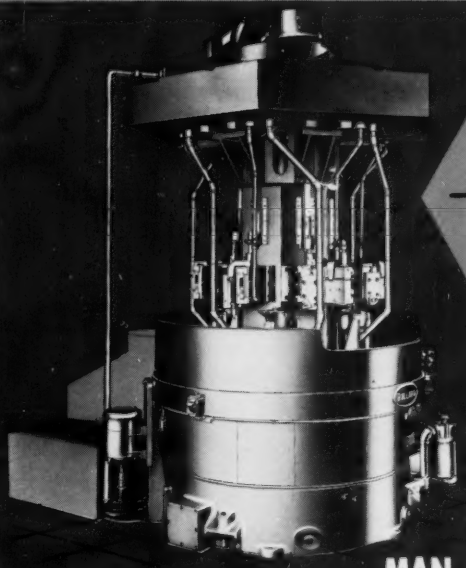
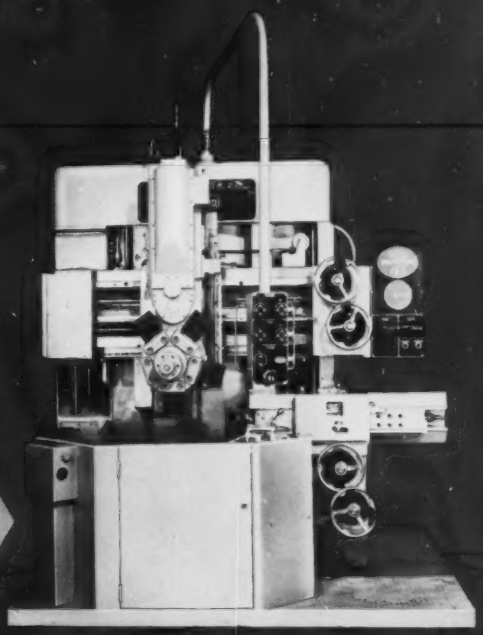


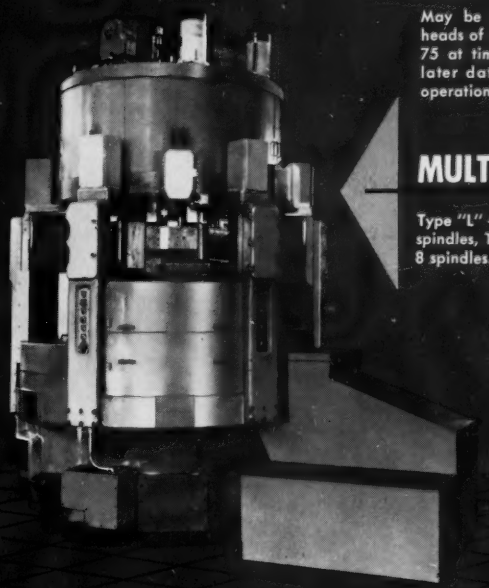
CONTIN-U-MATIC

Type "RD" 4, 6 and 12 spindles in 10"-14"-20" sizes.



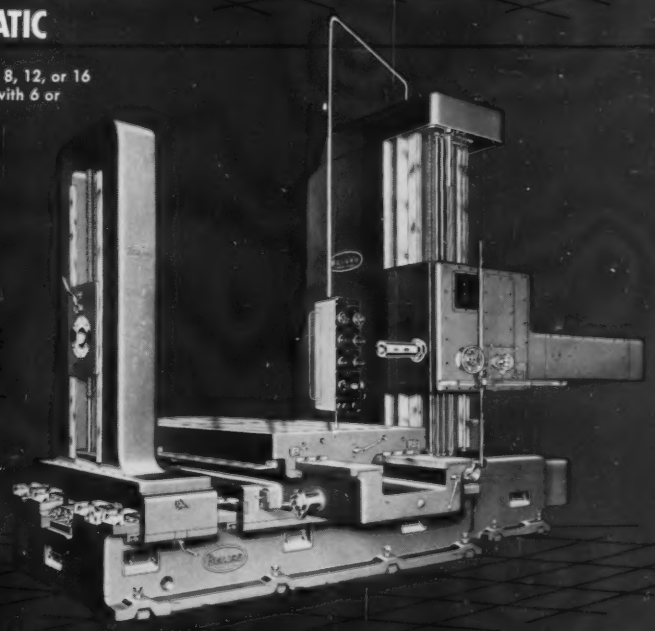
MAN-AU-TROL, Model 75

May be applied to any or all heads of Cut Master V.T.L. Model 75 at time of ordering or at a later date for fully automatic operation.



MULT-AU-MATIC

Type "L" — 10" with 6, 8, 12, or 16 spindles, 14" and 18" with 6 or 8 spindles.



HORIZONTAL BORING, MILLING AND DRILLING MACHINES, Model 75

3"-4" and 5" spindle with various bed lengths and post heights.

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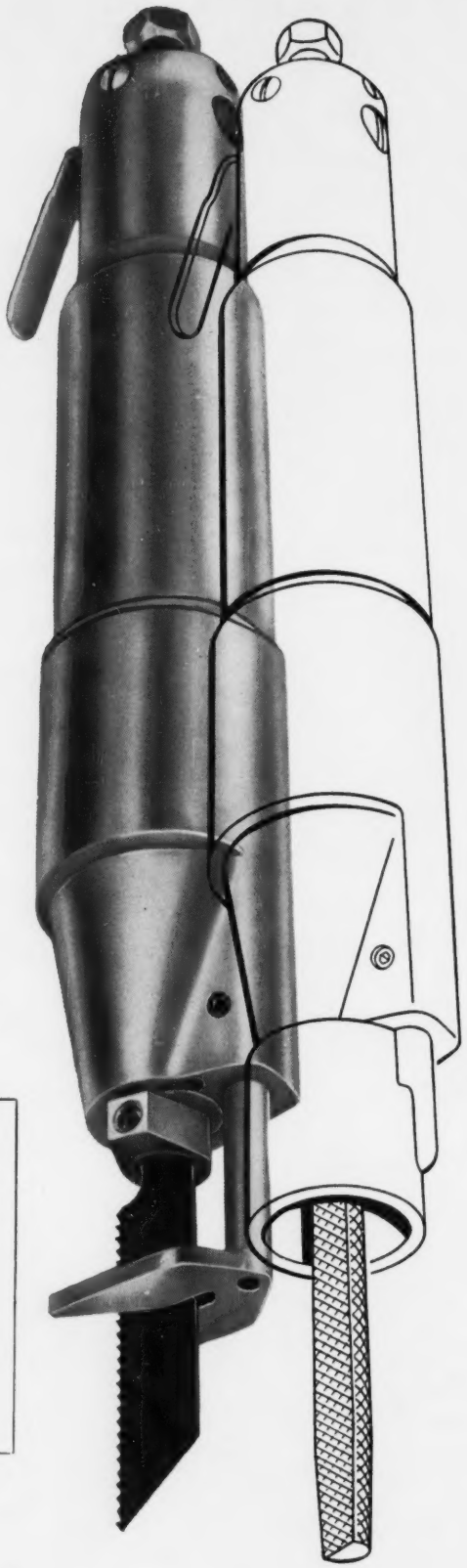
NEW!

the double-duty CP Air Saw



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Stainless Steel, Dural Alloys, Nickel, Copper, Aluminum, Iron, Steel, Brass, Plastics, Plexiglass, Fiberglass, Porcelain, Formica, Corrugated Transite Sheeting, Wood, Plywood, Hard Fibre, Wall Board, Masonite.

The CP Air Saw is not an attachment . . . it's a heavy-duty production tool that can take standard blades and files. The Chicago Pneumatic Saw has CONTROLLABLE POWER . . . a built-in speed regulator enables you to select the right speed for every specific work condition. When fitted with the blade collet it can saw practically every material and cut most any possible shape . . . a file chuck can be added to power bench files having round or flat shanks. *Chicago Pneumatic Tool Co., 8 East 44th St., New York 17, N. Y.*

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THIS PLANT HAD THE RIGHT IDEA

but not the *Right machine*

The Right Machine can make a whale of a difference. Sometimes it's the difference between showing a profit or just getting by. Often (in a machine job shop) it's the difference between getting the order or losing it.

Remember, the true cost of a machine is entirely dependent upon its output. If you don't have the right machine on your job, it may pay you to see that your competition doesn't get one first.

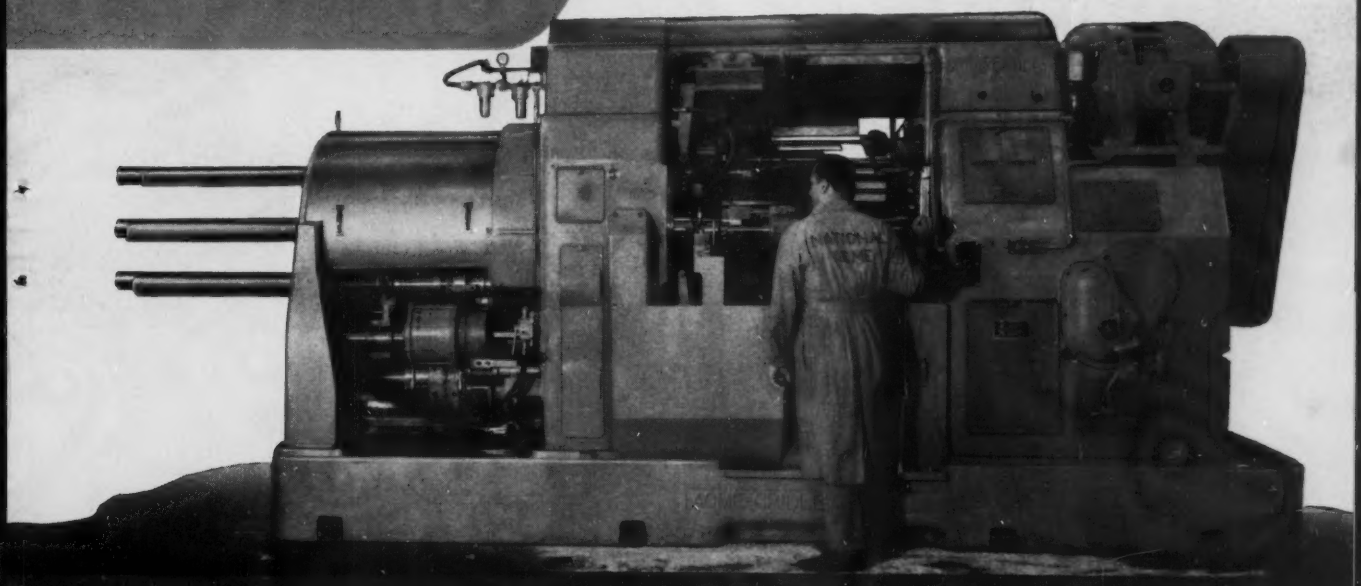
CHANGING FROM 4-SPINDLE TO 6-SPINDLE OPERATION, THIS PLANT NOW SAVES PLENTY ON *BIG PARTS*

In a large screw machine products plant, the RIGHT machine for the job was a *six-spindle* bar automatic *large enough to handle up to 6" bars.* The 4-spindle machine they were using was large enough, but they needed the extra tooling capacity that 6-spindle operation could give them.

Could National Acme solve their problem? National Acme not only could—but did. Today this plant has an ACME-GRIDLEY "BIG 6-INCH SIX"—the largest six-spindle bar automatic ever installed in a screw machine products plant.

Today they enjoy all the production benefits on large parts that six-spindle tooling is giving them on smaller ones. The "BIG 6-INCH SIX" is breezing along day after day performing all operations simultaneously, with only the time required for the longest single cut controlling output. And it's doing it with just *one machine setup.*

We'll be glad to study your operation and give you our recommendation, with no obligation to you.



Remember: You can't do **TODAY'S** job – with **YESTERDAY'S** tools – and make a profit **TOMORROW**

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1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • Limit, Motor Starter and Control Station Switches • Solenoids • Contract Manufacturing.

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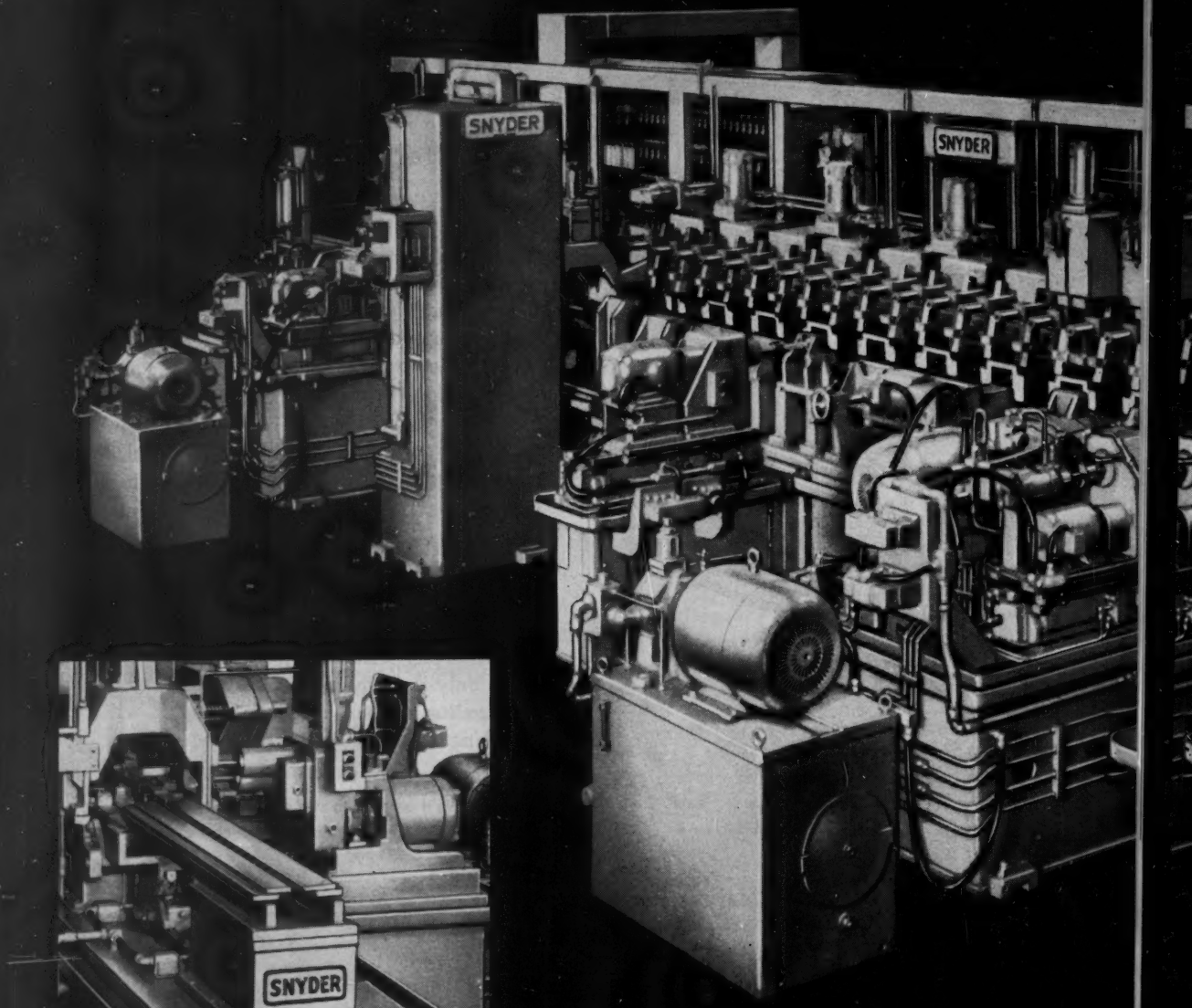
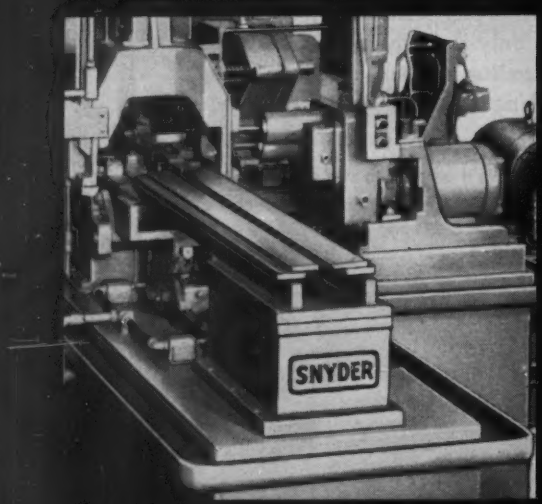
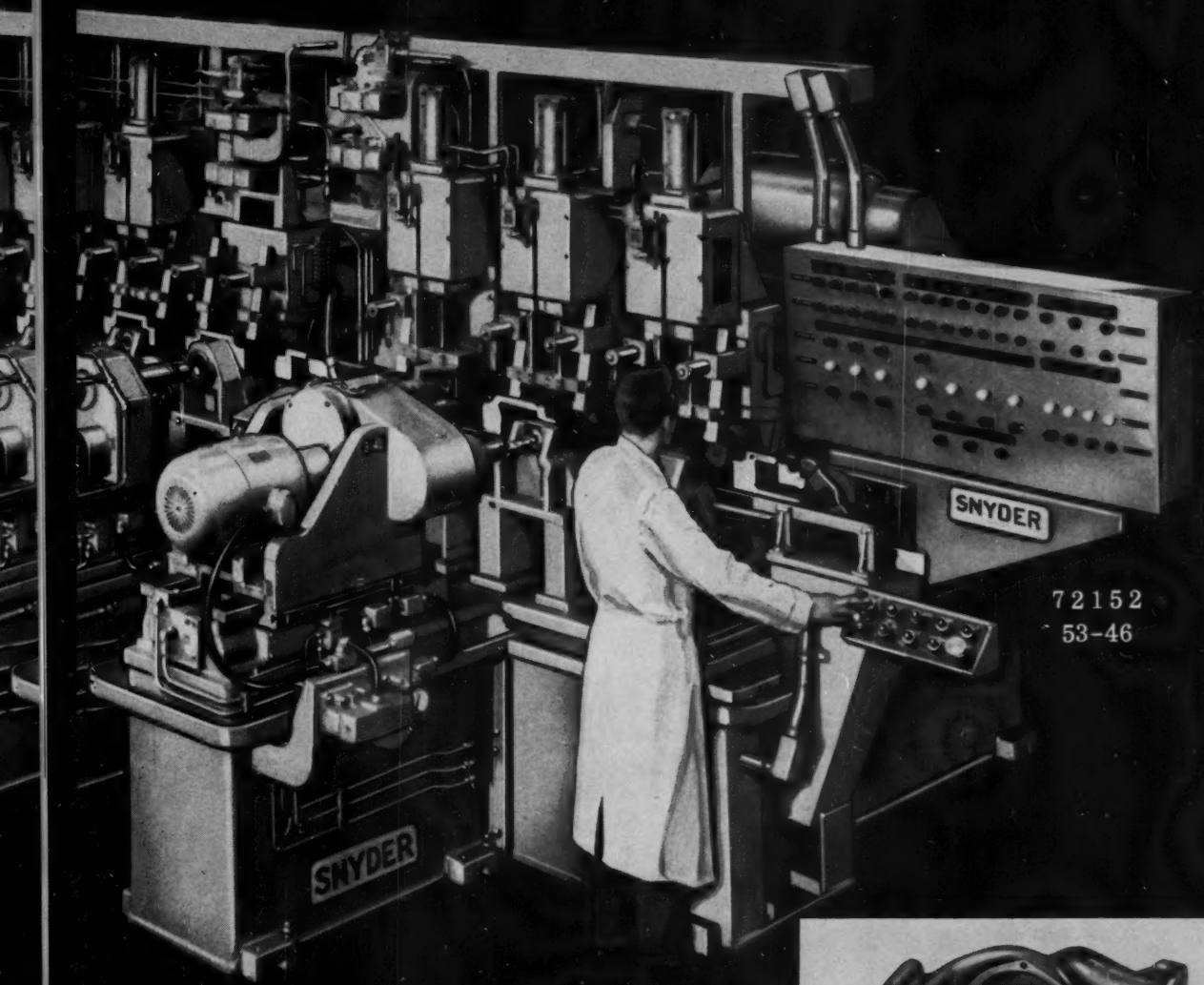




This is the discharge end of the machine. The part, which is originally in vertical position, is laid horizontally and swung 90° to expose all sides to the tools.

SNYDER SPECIAL automatic

24-station transfer machine for processing automotive water pump housings; drills, mills, faces, chamfers, taps all holes and probes tap drill holes. Production, 81 pieces an hour at 80% efficiency.



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SNYDER

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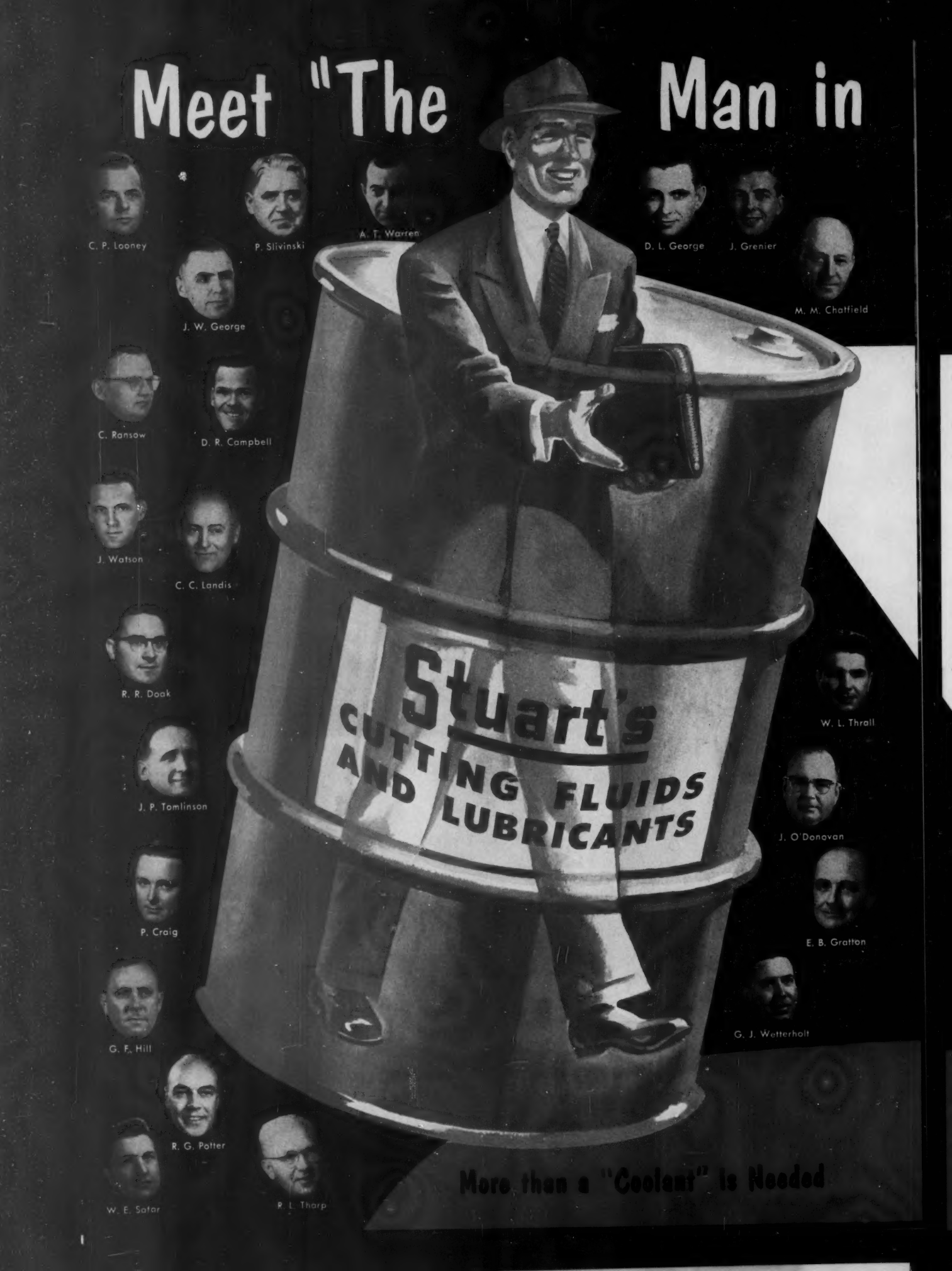
30 Years of Successful Cooperation with Leading American Industries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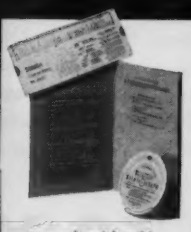
A. T. Warren
D. L. George
J. Grenier
M. M. Chatfield
J. W. George
C. Ransow
D. R. Campbell
J. Watson
C. C. Landis
R. R. Doak
W. L. Thrall
J. P. Tomlinson
J. O'Donovan
P. Craig
E. B. Gratton
G. J. Wetterholt
G. F. Hill
R. G. Potter
W. E. Satar
R. L. Tharp
Stuart's
CUTTING FLUIDS
AND LUBRICANTS
More than a "Coolant" is Needed

the Barrel"

. . . CONSULTANT ON INDUSTRIAL LUBRICATION PROBLEMS . . .

He's experienced, qualified . . . he knows how to solve industrial lubrication problems. Back of him is Stuart's research laboratory, one of the finest in the country exclusively devoted to industrial lubrication problems. Here, men are constantly at work developing new products and improving established ones so that Stuart customers are assured the best possible results . . . *greater production, improved surface finishes and longer tool life.*

Stuart products "The Man in the Barrel" sells include straight oil type cutting and grinding fluids, water-mix cutting and grinding fluids, drawing and stamping compounds and lubricating oils and greases for gears, bearings and machine tool ways. The next time you have an industrial lubrication problem, contact "The Man in the Barrel." With almost 90 years specialized company experience behind him, he's your best guide to the *right* oil for your job to *save you time, money and material.*



A quick guide to starting recommendations for any job

CLIP TO YOUR COMPANY LETTERHEAD AND MAIL TO

D. A. Stuart Oil Company
2739 S. Troy Street, Chicago 23, Illinois

☐ Please have "the Man in the Barrel" call.

☐ Please send Cutting and Grinding Fluid Selector and Dilut-O-Graph Folder.

Name_____

Title_____

D. A. Stuart Oil Co.
EST 1865 LIMITED

TIME-TESTED CUTTING FLUIDS AND LUBRICANTS

2739 S. Troy St., Chicago 23, Illinois

In Canada: Canadian D. A. Stuart Oil Co., Ltd., 2575 Danforth Ave., Toronto

The Machine Tool The User Boasts About

ROYAL OAK
HAS THE
FACILITIES
THAT
PAY OFF
IN DIE,
JIG, GAGE
AND
FIXTURE
QUALITY
Jig grinding is an operation that enables Royal Oak to produce gages, jigs, and other precision work to closest tolerances and quality finish. This Moore Jig Grinder, with offset provisions and special attachments, grinds internal and external surfaces and contours.
ROYAL OAK TOOL AND MACHINE CO.
29800 Stephenson Hy.
Royal Oak, Mich.

REPRINT OF RECENT FRONT-COVER ADVERTISEMENT IN "TOOLING & GAGING"

The Moore Jig Grinder

Thumb through the next facilities booklet that comes across your desk... look at the trade journal advertisements stressing topflight facilities ...chances are you'll see one or more Moore Jig Grinders featured prominently.

The Moore Jig Grinder has become the Cadillac of the toolroom (while remaining in a Chevrolet price range). It's a center of attraction on plant tours. The plant manager will point to it, beam like a new father showing snapshots of his offspring, and say: "And there's our Moore Jig Grinder!"

Why do so many users point with pride to the *Moore* Jig Grinder?

Because Moore invented the first jig grinder to relocate and grind straight and tapered holes to "tenths" in a fraction of the time required by other means.

Because the current No. 2 Moore Grinder extends this function to regular and irregular contours, making standard practice of former "trick" operations.

Because this machine employs the lead screw measuring system to assure accuracy, flexibility and speed.

Because electric heating elements and many other features have been designed into the Moore Jig Grinder to assure dimensional stability and wear resistance—and, consequently, *permanence* of accuracy.

Because it's the perfect partner for the popular Moore Jig Borer in achieving accuracy, speed and economies on countless toolroom and production jobs.

For complete information on the machine tool *the user* boasts about, write today for the Moore Jig Grinder catalog.

Moore Special Tool Company, Inc.
734 Union Ave., Bridgeport 7, Conn.

ADD MOORE TOOLS (SPEED + ACCURACY) TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

For more information on products advertised, use Inquiry Card, page 241

Pinion carrier for an aircraft planetary reduction gear.

Impeller shaft for aircraft supercharger.

Aircraft cam gear.

Breech block for an automatic rifle.

The Gleason No. 26 Quenching Press for parts up to 25" in the maximum dimensions.

The Gleason No. 140 Quench Machine for shafts and similar parts 5/16" to 4" in diameter, up to 43" in length.

How to hold parts like these to close tolerances during quenching

Are you troubled by warpage or distortion of precision parts during hardening?

If you have this problem, Gleason Quenching Equipment can help solve it with substantial savings in costs.

This equipment provides automatic, controlled quenching of flat, round, irregular, or shafted parts insuring alignment and minimizing distortion.

For round, flat or irregular parts up to 36" in the maximum dimension there are three sizes of Gleason Quenching Presses of the type shown at the top right.

For shafts or similar parts there is the Gleason Rolling Quench Machine, shown at lower right. It accommodates shafts from $\frac{9}{16}$" to 4" in diameter, from 6" to 43" in length, and can handle parts with integral cams, gears or shoulders up to 8" in diameter.

In all these machines the heated part is held under pressure. Flow of the quenching fluid to each portion of the heated part is accurately controlled at preset rates during all stages of the quenching cycle.

In the Quenching Presses precision dies hold the part in alignment and direct the flow of quenching medium during the quenching cycle. In the Rolling Quench Machine the part is rolled under controlled pressure. Relative pressures applied to the various portions of the part are accurately and automatically controlled.

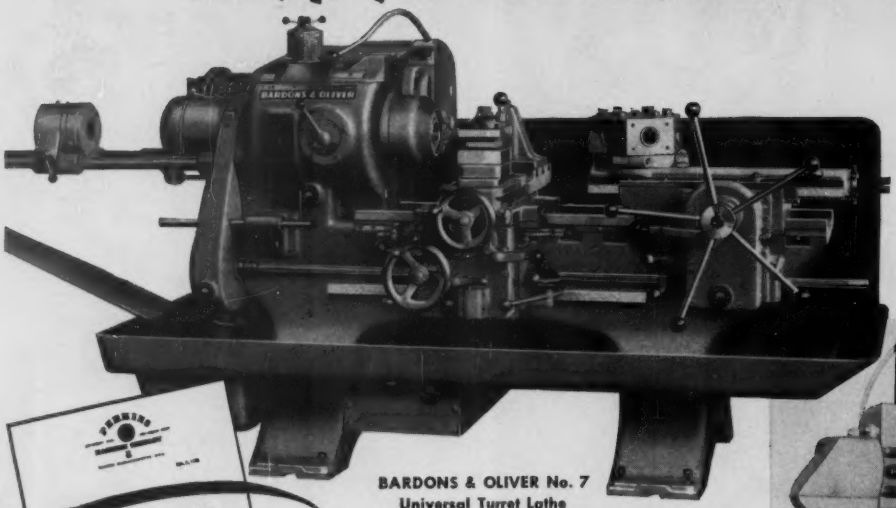
The use of Gleason Quenching Equipment eliminates the need for any subsequent straightening. This is important for two reasons: (1) It saves one operation, reducing production costs. (2) Hardened parts which do not require straightening have less residual stress. Further information will gladly be sent on request.

GLEASON WORKS

Builders of bevel gear machinery for over 85 years

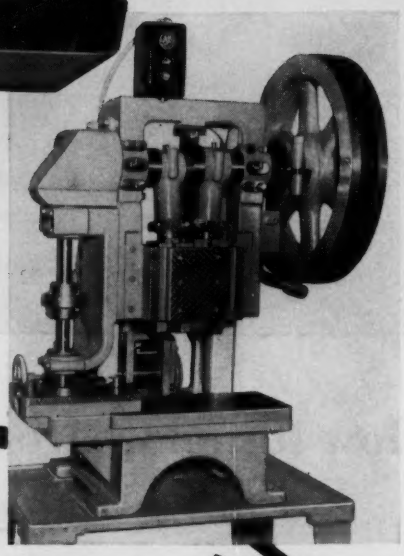
1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

"TROUBLE-FREE PERFORMANCE"
"LOW MAINTENANCE"
...At Perkins Machine Company



BARDONS & OLIVER No. 7
Universal Turret Lathe

Pictured at the right is the Perkins Machine Company's New Model 3 AAT Transfer Press, parts of which are made on BARDONS & OLIVER Turret Lathes.



Bardons & Oliver, Inc.
1133 West Ninth Street
Cleveland 13, Ohio

Gentlemen:

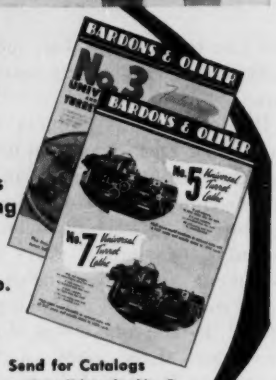
Perkins Machine Company purchased their first Bardons & Oliver Universal Turret Lathe over thirteen years ago. We now have in operation all three sizes of Bardons & Oliver Ram Type Universal Turret Lathes, namely No. 3, No. 5 and No. 7. These machines have been of great help in reducing the production cost of our complete line of presses, including our New Model No. 3 AAT.

We have always been able to depend on our Bardons & Oliver Turret Lathes to produce to close dimensional tolerances, while, at the same time removing the maximum amount of stock in minimum time.

Ease of operation, together with trouble-free performance, and low maintenance requirements, have made these machines favorites in our shop.

Very truly yours,
PERKINS MACHINE COMPANY

B. W. Perkins, Treasurer



Send for Catalogs describing the No. 3 or No. 5 and 7.

BARDONS & OLIVER, INC.

1135 WEST 9TH STREET • CLEVELAND 13, OHIO

For more information on products advertised, use Inquiry Card, page 241

CLEVELAND
REDESIGNED END MILLS

Cut faster • Clear chips better
Greater accuracy • Stronger • More durable

Engineered to give you maximum cutting qualities at greatly increased rates of feed, with a minimum amount of wear.

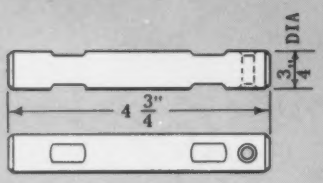
THE **CLEVELAND** TWIST DRILL CO.
1242 East 49th Street • Cleveland 14, Ohio
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58
E. P. Barrus, Ltd., London W. 3, England

TELEPHONE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

THERE'S ONLY ONE WAY TO DO A JOB BEST... *Another Production Solution*

by MOTCH & MERRYWEATHER!

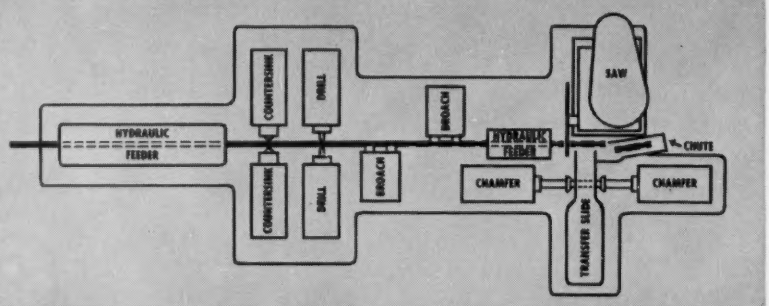
THE JOB TO BE DONE

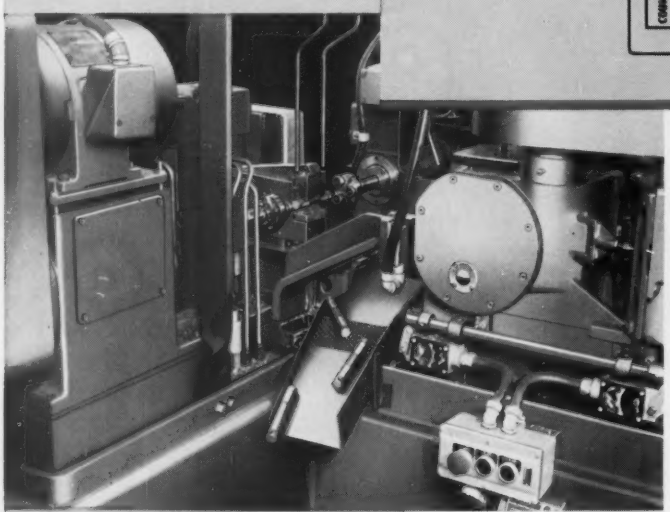


Part: Differential pinion shaft.

Operations: Countersink, drill, broach two sides, Triple-Chip cut off, and chamfer both ends.

HOW M & M DID IT BEST





M & M attained production of 300 pieces per hour at 100% efficiency.

Again, the one best answer is by a Motch & Merryweather in-line automatic transfer machine, designed and built for this one purpose. In-line speedy progression — no wasteful starting and stopping — stock clamping at each station — automatic stock bar loading can be added for complete automation. *Result:* rapid fire production that quickly pays out. This in-line machine is but one illustration of a production solution by Motch & Merryweather.

Ask us now for any production-machining aids. No obligation.

By combining operations, production was increased with a minimum of floor space and labor required.

THE MOTCH & MERRYWEATHER MACHINERY CO.

MACHINERY MANUFACTURING DIVISION

CLEVELAND 13, OHIO

Builders of Circular Sawing Equipment, also Production Milling, Turning, and Special Machines

For more information on products advertised, use Inquiry Card, page 241

Whatever kind of gears you make...
Whatever way you make them

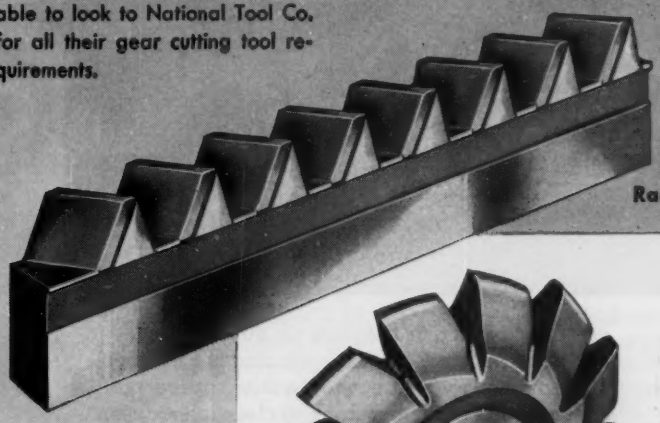
National Tool Co.

can supply the right type cutting tool because we make *all* types

National Tool Co., with 50 years experience in the manufacture of special cutting tools, makes *all* varieties of gear cutting tools for *all* types of spur, helical and worm gears—as well as for sprockets and splines. Whatever your gear requirements—large or small—National engineers can help you decide the most efficient method of producing them. Many gear manufacturers have found it profitable to look to National Tool Co. for all their gear cutting tool requirements.

Gear Shaving Cutters

Hobs



Rack Type Gear Shaper Cutters

Gear Shaper Cutters

Involute Gear Cutters

Master Gears

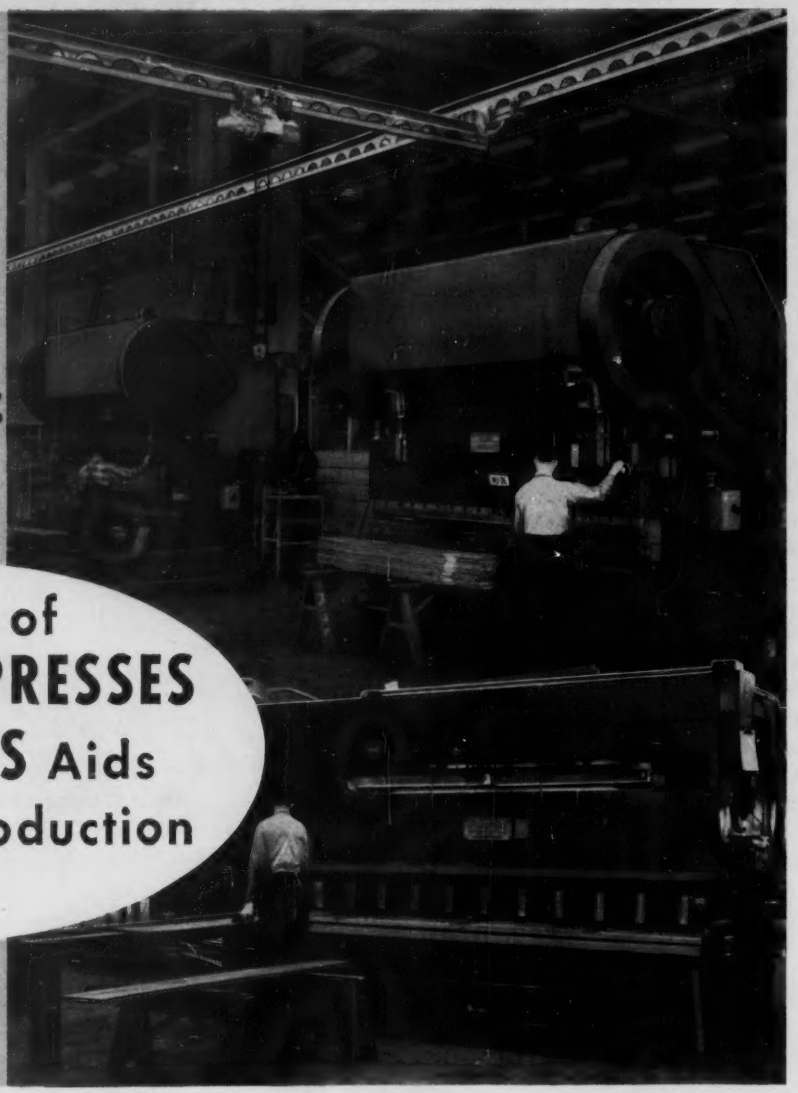
Herringbone Gear Cutters

Representatives in major industrial centers

National Tools Cleveland

National
TOOL CO.
Cleveland 2, Ohio

Two of the Steelweld Presses in action. These are Model K5-10 machines rated for 12'-0" x ⅜" steel plate. Note how Cleveland Tramrail cranes serve these presses.



Battery of STEELWELD PRESSES and SHEARS Aids Caterpillar Production

Shearing long ½-inch thick strips into small rectangles on a Series 8D-10 Steelweld. The long extension squaring arm at front facilitates this work.

THOUSANDS of tons of steel of different thicknesses are sheared and formed on Steelweld Shears and Presses into various shapes required for the large volume of tractor equipment produced at the new Joliet, Illinois, plant of Caterpillar Tractor Co. These items include scrapers, rippers, bulldozer blades and wagons.

The heavy construction of Steelweld machines and many high quality features with which they are provided make possible continuous trouble-free performance. Their design includes a number of innovations which ease operation, speed production and enable accuracy to close tolerances.

The fact that Caterpillar has bought Steelweld Shears and Presses repeatedly and now has a large battery of them is mute testimony to the satisfaction they are giving.

GET THESE BOOKS!

Catalogs No. 1010 (Presses) and No. 1011 (Shears) give construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

5450 EAST 281ST ST. *WICKLIFFE, OHIO.*

STEELWELD

PRESSES and SHEARS

For more information on products advertised, use Inquiry Card, page 241

Production Up 40%
Fuel Costs Down 80%
Sections of "track roller shaft" before welding
"Track roller shaft" after TOCCO Induction Welding

with TOCCO* Induction Welding

Here's the story of how one company, a large manufacturer of automotive equipment and farm implements, is using TOCCO Induction Heating to increase production and effect substantial savings at the same time.

Production Increased

When TOCCO Induction Heating replaced oxy-acetylene, output of these hollow "track roller shafts" went up from 220 to 300 pieces per 8 hour shift. The heating cycle with TOCCO is only 55 seconds as opposed to 90 seconds formerly required with gas. Result: much lower labor cost per unit.

Fuel Savings

Fuel costs nosedived from $10.50 per hundred pieces to only $1.95—about $25 per shift saved on fuel costs alone. Other important savings have resulted from a substantial reduction in down time and maintenance costs. Quality of the weld is more uniform with Induction, and hazards of explosion present with former method are eliminated.

If the manufacture of your product involves welding, heat treating, forging, brazing or the melting of ferrous or non-ferrous metals, don't overlook TOCCO as a sound method of increasing production, improving product quality and slashing costs.

THE OHIO CRANKSHAFT COMPANY

Mail Coupon Today

FREE BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. M-2, Cleveland 1, Ohio

Please send copy of "TOCCO Induction Heating."

Name_____

Position_____

Company_____

Address_____

City_____ Zone___ State_____

FOOTBURT

sensitive drilling machines

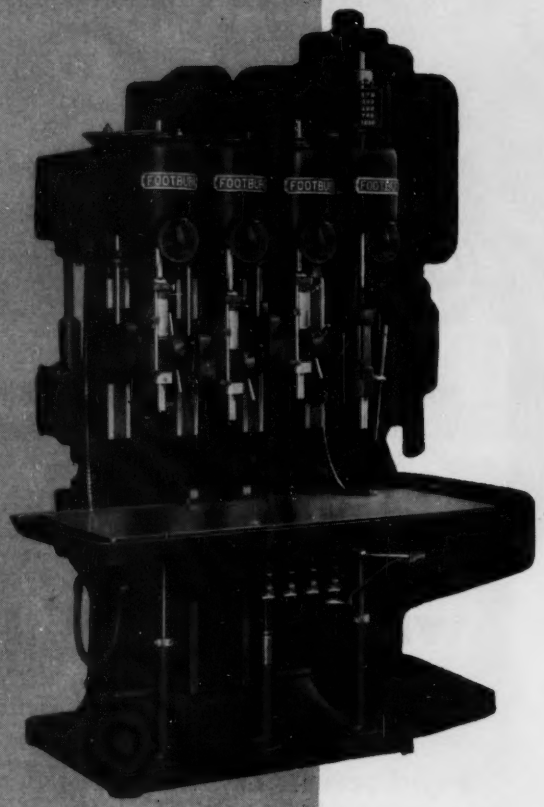
A FULL RANGE

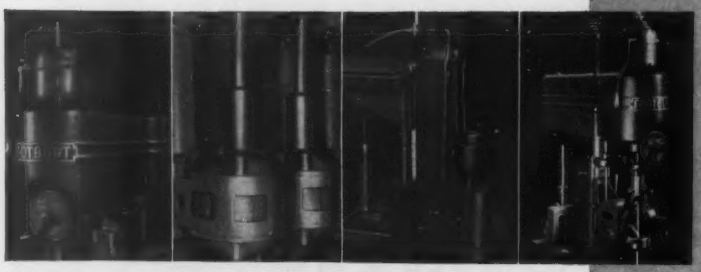
DRILLING MACHINE

ENGINEERED FOR PRODUCTION

Built carefully to provide the required accuracy for fine tool room work, Footburt Sensitives are designed with the weight and stability to maintain close tolerances on day after day production work. The correct speed for a wide range of drilling, reaming, and counterboring operations is instantly available. Write for full information on this great line of Sensitive Drilling Machines. Built in 1, 2, 3, 4, 6 Spindle Models.

THE FOOTE-BURT COMPANY
Cleveland 8, Ohio
Detroit Office: General Motors Building





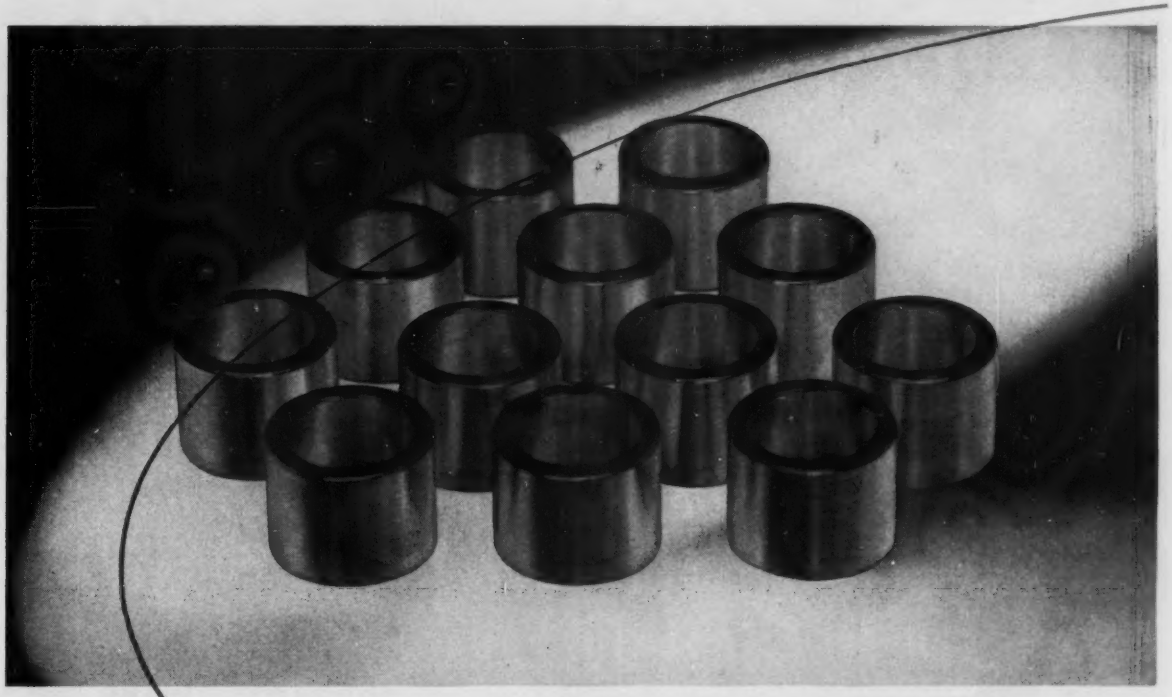
No. 2 Machine with Back Gear • 12″ Overhang • 5/8″ Drilling Capacity in Steel • Optional Speed Ranges • 185 to 2300 RPM • 280 to 3450 RPM • Vertical Motor Drive with Standard Single Speed Motor • Power Feed Assembly • Tapping Attachment • Coolant Outfit.

engineered for production

FOOTBURT

MACHINE TOOLS

For more information on products advertised, use Inquiry Card, page 241



these requirements in mind...

So varied are the demands on multiple spindle automatics it is impossible to design into one model — or a number of models — all the facilities that will satisfy every requirement. To excel in any range of work the design of a machine of this type must be directed toward that work.

Cone's new General Datalog lists over forty CONOMATIC models that are designed with these requirements in mind. For any range of work, Conomatics are built to more efficiently serve the latest cutting tool materials.

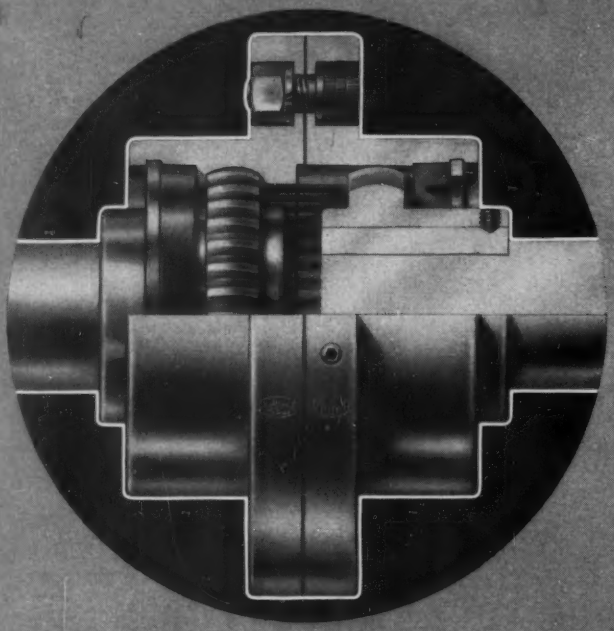
data for comparison

Part	Bushing
Machine	1⅛" Six Conomatic
Tools	100% Carbide Tipped
Material	Stainless Steel Tubing
Stock Size	1¼" OD; ¾" ID
R. P. M.	Work Spindle — 1033 Opposed Spindle—1048
Time	7 Seconds per Cycle 3.5 Seconds per Piece

Conomatic} CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

A BETTER GEAR COUPLING

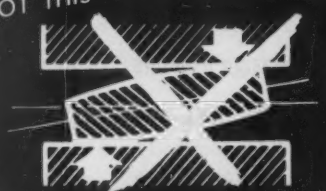
...with teeth cut on a true ARC



SPHEREFLEX

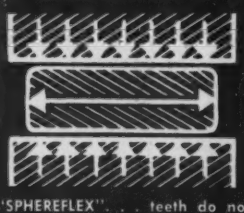
- UP TO 7° ANGULAR MISALIGNMENT
- FULL FACE TOOTH CONTACT ALWAYS
- CONSTANT ANGULAR VELOCITY

NOT THIS



Standard gear type coupling—note excessive backlash and stress concentration when coupling is flexed.

THIS



"SPHEREFLEX"... teeth do not depend on backlash—teeth mesh snugly together, tolerances are reduced to absolute minimum.

The new and different "SPHEREFLEX" Coupling has been exhaustively tested in a wide variety of severe applications—and in every instance has proved itself a superior coupling. "SPHEREFLEX" Couplings are now available from stock at competitive price levels with conventional couplings.

The "SPHEREFLEX" is different and better, because the male teeth are cut on a "true spherical arc", while the internal teeth are cut with a straight root—permitting the curved tooth to always maintain a full line of contact with internal tooth even when the coupling is flexed. . . . Also this feature eliminates the usual dependency for flexibility upon excessive backlash between coupling teeth, point contact or springs. . . . In fact, size for size, the "SPHEREFLEX" Coupling will withstand higher horsepower and greater misalignment than any other comparable coupling. Standard "SPHEREFLEX" Couplings will compensate for angular misalignment up to 3½° plus or minus on each coupling half, or a total of 7°. Special "SPHEREFLEX" Couplings are available for 14° misalignment. Write for new Catalog C-540.

PHILADELPHIA GEAR WORKS, INC.

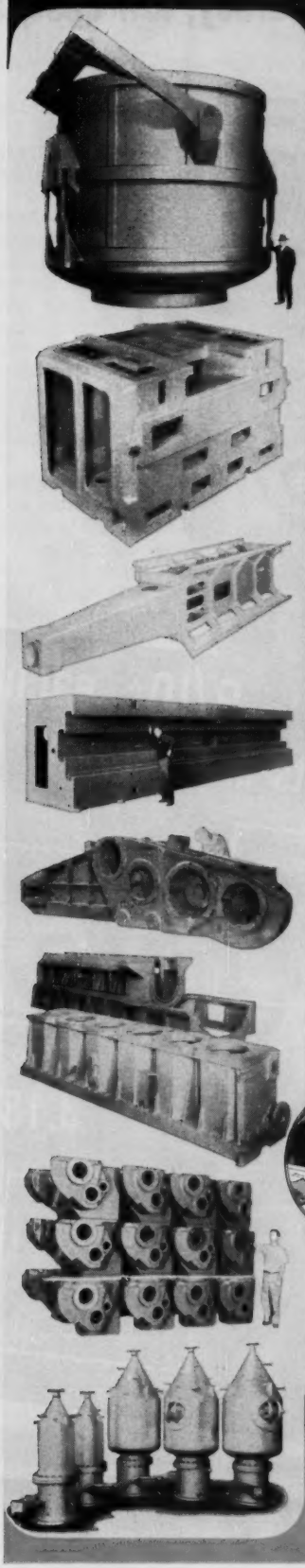
ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.
Virginia Gear & Machine Corp., Lynchburg, Va.

Industrial Gears & Speed Reducers

LimiTorque Valve Controls

established 1892

For more information on products advertised, use Inquiry Card, page 241



Use WELDED STEEL for Greater Strength with Less Weight!

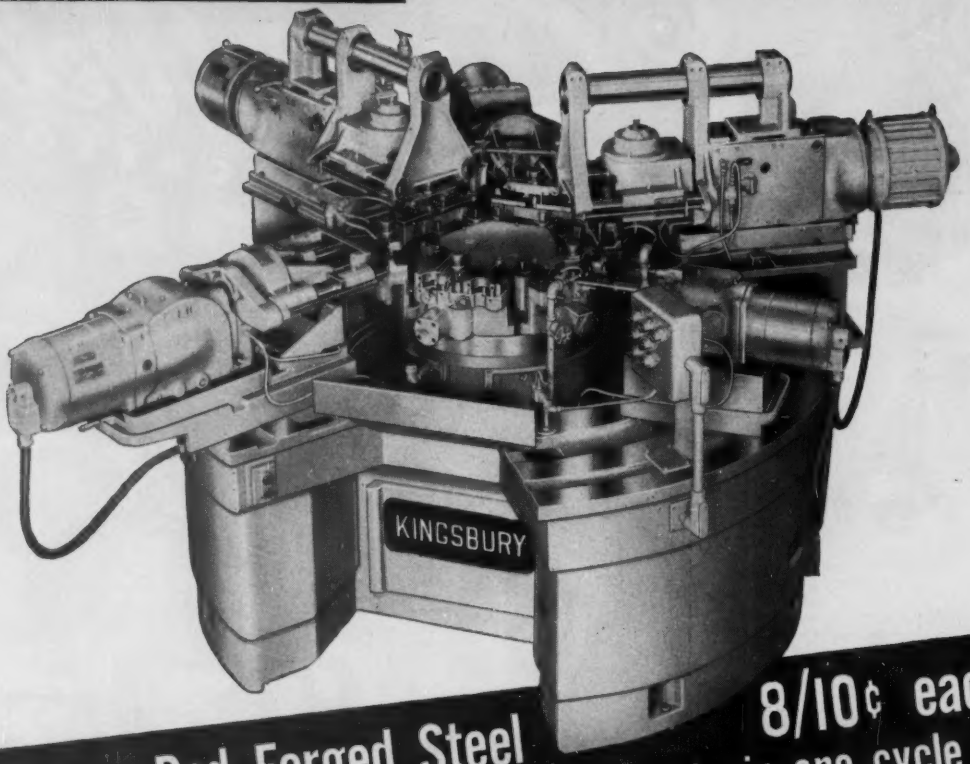
Steel-Weld Fabricated parts and assemblies can save you time and money in many ways . . . they eliminate pattern costs and give you greater strength with less weight. The parts and assemblies shown at the left, and the forty-ton frame and carriage shown above—parts of a loading device for a large extrusion press—are typical examples of thousands of Steel-Weld Fabricated units produced and machined by Mahon for manufacturers of processing machinery, machine tools, and other types of heavy mechanical equipment. If you need a special mechanical device, or if you require parts or assemblies involving large heavy pieces where time and pattern costs are a consideration, you can call on Mahon with complete confidence . . . personnel and facilities are available within the Mahon plant to handle the entire job from drawing board to finished machining and assembly. You will find in the Mahon organization a unique source . . . a source where design skill and advanced fabricating technique are supplemented by craftsmanship which assures a smoother, finer appearing job embodying every advantage of Steel-Weld Fabrication. See Sweet's Product Design File for information, or have a Mahon engineer call at your convenience.

THE R. C. MAHON COMPANY
DETROIT 34, MICHIGAN

Engineers and Fabricators of Steel in Any Form for Any Purpose

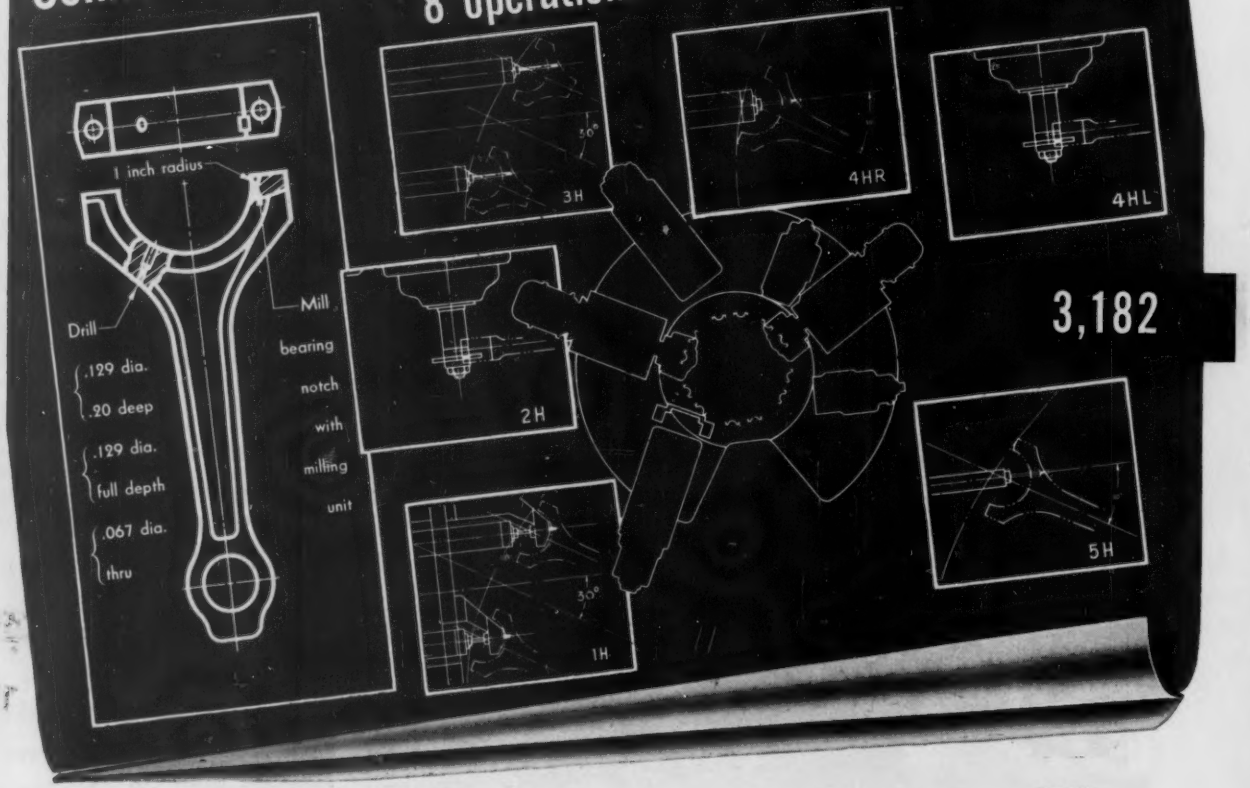
MAHON

"Operations Kingsbury" . . . required accuracy, low cost, high



Connecting Rod Forged Steel 8/10¢ each

8 operations on 2 parts in one cycle



3,182

For more information on products advertised, use Inquiry Card, page 241

production for interchangeability

Here are two Kingsburys, custom-built to serve in widely separated product fields. Each justifies its investment. One drills a small hole and mills a notch in a forged steel connecting rod. The other works on a cast aluminum sole plate for a steam iron: drills 26 holes and spot-faces a boss.

Could this work be done on single-operation machines? "Yes." But could the connecting rods be machined for eight-tenths of a cent each? And the sole plates for one-and-one-fifth cents each?

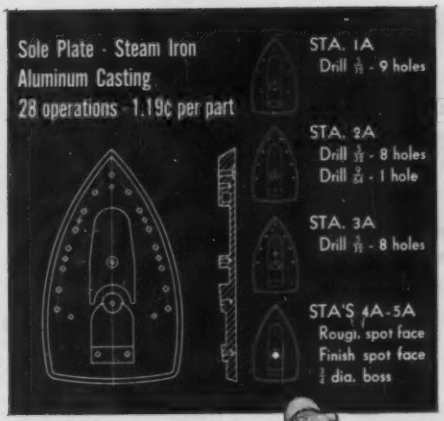
Kingsburys have so many advantages. For example: One work fixture positions the part for each successive operation. Standard units perform the operations within a pre-determined time cycle to obtain the best output with required accuracy. Tolerances are held to specifications. Scrap loss is reduced to a minimum. Floor space is saved. Handling is reduced. One operator loads and unloads the machine. And your parts will be interchangeable, reducing your assembly time.

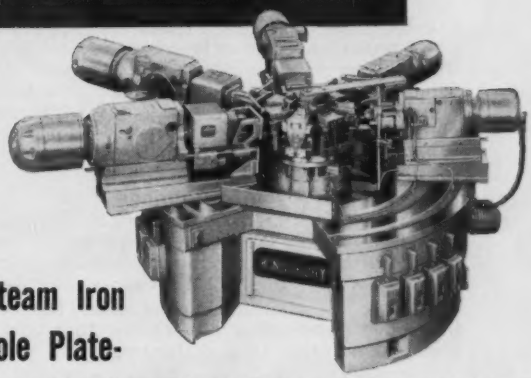
You can drill, spot drill, flat-bottom, ream, burr-ream, counterbore, countersink, mill, end-mill, hollow-mill, tap, thread, face, spot-face, form, recess, saw, trepan . . . all within certain limitations. For instance: Your product must be such that it can be machined within the limits of 5 HP units, and of a size and/or weight that can be handled efficiently by an operator.

We have some interesting bulletins we shall be glad to send you. Perhaps you manufacture a part where a few cents saved would put you in a better profit position and pay for the cost of a Kingsbury. Let's talk it over.

Kingsbury Machine Tool Corp.
107 Laurel Street, Keene, N. H.

KINGSBURY
AUTOMATIC DRILLING AND TAPPING MACHINES
for Low-Cost High Production





Steam Iron Sole Plate- Cast Aluminum 17,920 operations per hour

Here's a case where a Kingsbury really "gangs up" to get the work out! The part is a cast aluminum sole plate for a steam iron; 26 angular holes to be drilled and one boss to be spot-faced.

The machine has an 80-inch base and a 20½-inch diameter index table with 7 fixtures. Five drilling units are mounted on the base. Two of these have 9 spindles each, one has 8 spindles and two have single spindle heads to perform the rough and finish spot-facing operations on one ¾-inch boss. Bushings guide all tools.

The table indexes through five working stations. At Station 6, work is unclamped automatically and removed by the operator. At Station 7, the operator places new work in the fixture, where it is clamped automatically.

Operations per hour on two forged steel connecting rods

The problems: to drill a concentric step-down hole thru, at an angle of 30°, in each of two connecting rods; also to mill a notch in each rod for the bearing.

To obtain high production at low cost per part, the machine was designed to handle *two* parts in each work-holding fixture. Six Horizontal (H) Units are mounted radially on an 80-inch base. The 26-inch index table has six of these "twin" work-holding fixtures, automatically clamped and unclamped. The machine indexes through five work stations where eight operations are performed. The longer holes are drilled in two operations to maintain a balanced time cycle at each station. Bushings guide all drills.

Station 1, Unit 1 H has two-spindle head and drills one .129 dia. hole at an angle of 30° in each rod to half the required depth.

Station 2, Unit 2 H with milling unit mills the notch in the *right* hand part.

Station 3, Unit 3 H has two-spindle head and completes the drilling of the .129 hole in each rod.

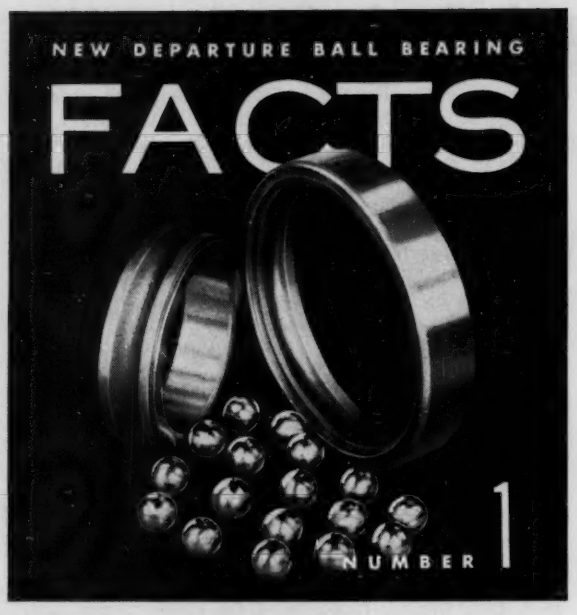
Station 4, Unit 4 HR is a single spindle unit with sensitive feed; drills .067 hole thru from bottom of .129 hole in *right* hand part. *Unit 4 HL* with milling unit mills the notch in the *left* hand part.

Station 5, Unit 5 H is a duplicate of Unit 4 HR: drills .067 hole thru from bottom of .129 hole in *left* hand part.

Station 6: operator removes the two finished parts and replaces them with two new parts. Parts are unclamped and clamped automatically in the work fixture.

PRECISION SOLUTION

to combination loads!



Combinations of axial and radial loads on moving parts present a constantly recurring problem to the engineer and designer. And this problem is further multiplied by today's demand for lasting precision with minimum service and adjustment. Naturally, too, every designer strives for a basic simplicity in his product that means manufacturing economy.

A Job For Bearings

The work of holding moving parts in a predetermined position or location must fall on the bearings. How well they maintain the desired accuracy . . . and for how long . . . determines their value.

Because of certain inherent qualities, ball bearings offer outstanding advantages that can be found in no other type of bearing.

Basic Advantages Of The Ball

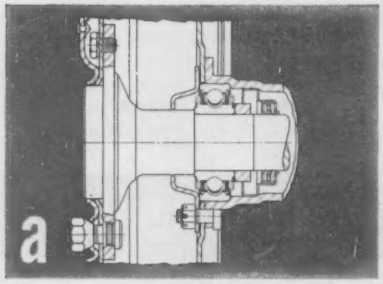
The ball is a unique shape. It rolls naturally in any direction. It has no weakest point. In combination with raceways of proper design, it can resist all loads.

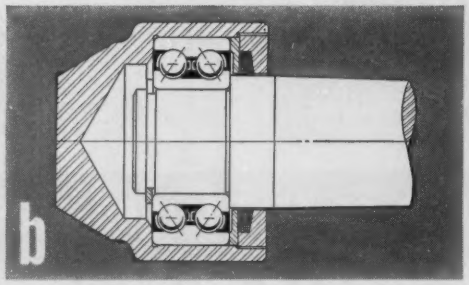
Parts are held rigidly in position and, since wear is virtually nonexistent in properly enclosed ball bearings, no adjustment is required. Regardless of the angle at which load is applied, a uniform and readily calculable resistance is presented, and bearing life may be accurately predicted. Ball bearings thus may be readily selected to match the service expectancy of the machine in which they are used.

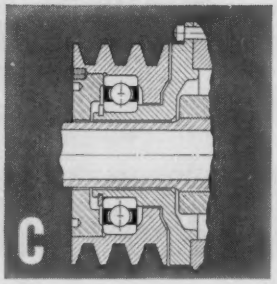
New Flexibility For Machines

Through this ability to resist all loads, machines using ball bearings can be operated in any position and at high or low speeds. One compact ball bearing can often replace an installation of two other bearings of different load-carrying abilities.

New Departure will welcome the opportunity to work with you on any bearing problem. Remember, there is no substitute for experience—and for more than 50 years New Departure has led in bearing design, testing and manufacture.







A. In this automobile rear wheel mounting the axle shaft is located against thrust in both directions by a single New Departure Sealed-for-Life bearing. Adjustments and need for relubrication are eliminated. Here are definite advantages over other types of anti-friction bearings.

B. In applications subject to heavy thrust, such as live centers, double row New Departure *ball* bearings give excellent performance. These bearings may be internally preloaded for maximum resistance to deflection under load. In this example, the center nose is ground after assembly.

C. In applications such as pulleys, New Departure radial, nonloading groove bearings may be used singly for radial, thrust or combined loads according to rated capacities. Thrust and radial capacities are approximately equal.

For complete information send for Booklet BA-6

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN.

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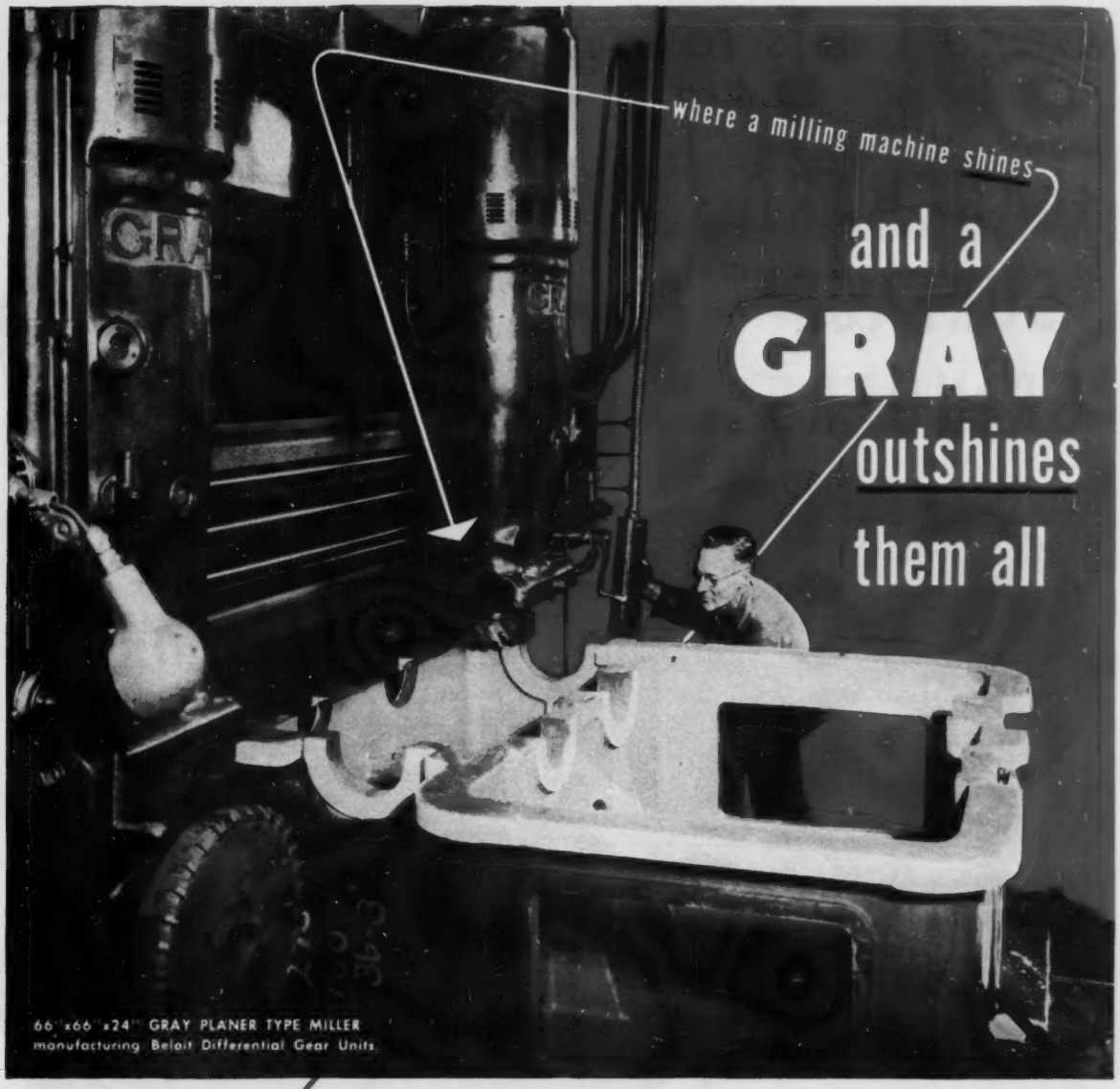


66" x66" x24" GRAY PLANER TYPE MILLER
manufacturing Beloit Differential Gear Units

When it comes to delivering HIGH LOW COST PRODUCTION... GRAY PLANER TYPE MILLERS really shine in up-to-the-minute plants where only the finest precision work is acceptable.

here's why

- Compact GRAY Unit Heads make possible a wide variety of simultaneous high horsepower cuts. Each head has individual spindle motor.
- Speeds up to 1000 RPM are instantly obtained by the flick of a lever.
- Low Hung Drive to the spindle through a balanced planetary gear train with fly wheel inertia provides the ideal high horsepower carbide cutter drive.
- Efficient swivel or non-swivel design heads as desired.

a GRAY will shine in your plant when you see how it increases production — reduces time and costs.

The G.A. GRAY Company

planers • milling planers
planer type milling machines
horizontal boring machines

Dept. B

CINCINNATI 7, OHIO, U. S. A.

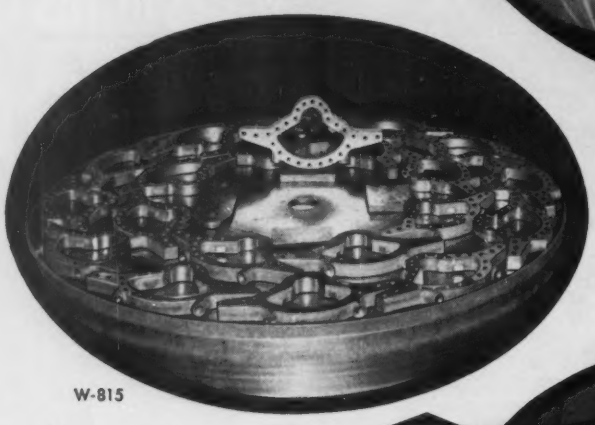
SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

Grind Costs to a Minimum!

with BLANCHARD SURFACE GRINDERS

W-1102

Blanchard surface grinders are noted for their ability to save time and labor in machining flat surfaces. For example, a No. 18 Blanchard machines the steel blocks shown above at the rate of 4 cubic inches per minute . . . and produces finished tolerances for flatness, parallelism and dimension of .001" to .002"!

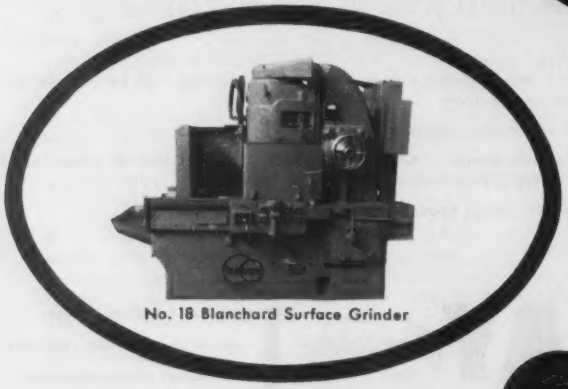


W-815

By dressing the chuck and using the correct wheel, the same Blanchard will finish grind pump parts to a flatness of .0002" . . . with surface finish of 4 to 6 micro-inches . . . at a rate of 40 pieces (80 surfaces) per hour!

W-802

Blanchard ground to make *tight* joints! These valve plates are used in refrigerator compressors.



No. 18 Blanchard Surface Grinder

Obsolete machining methods often result in high costs and low profits. If you are not getting maximum production, consider using Blanchard surface grinders. They're economical, extremely accurate and highly productive on a wide variety of jobs. And they enable you to make a decent profit at competitive prices.

Send for free copies of "Work Done on the Blanchard", (fourth edition), and "The Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

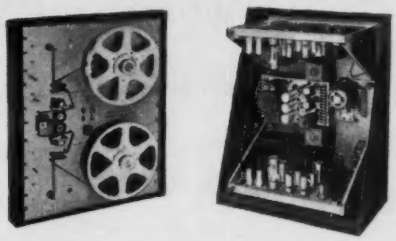
THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

For more information on products advertised, use Inquiry Card, page 241

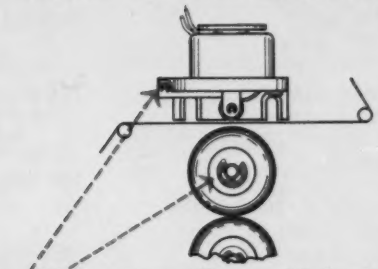
30 Waldes Truarc Rings Save Space and Time... Simplify Assembly and Disassembly

Potter's New Digital Magnetic Tape Handler



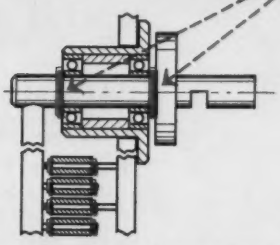
■ Prime requirements: fast starts, fast stops, fast tape speeds, great accuracy. Using Truarc rings, this new model starts and stops the tape within 5 milliseconds, has tape speeds up to 60 inches per second.

Solenoid Mount and Capstan Assembly



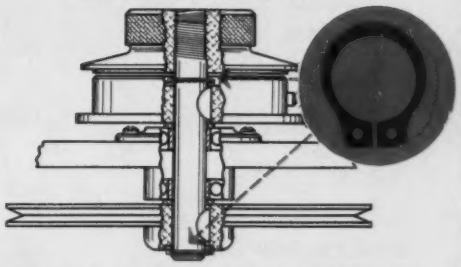
■ Miniature Truarc E-Rings on .040 diameter shaft and on continuously running capstans eliminate projecting bolts and screws. Rings permit rapid assembly and disassembly, fast replacement of worn rubber capstans.

Tension Shaft Assembly



■ Truarc E-Rings snap quickly into place, act as shoulders for the ball bearings with a minimum of friction. Additional Truarc Rings are used as spacers on shafts, can be located accurately to extremely close tolerances.

Reel Shaft Assembly



■ Truarc Standard Rings (Series 5100) hold the reel shaft assembly firmly in place and permit the use of quick-lock hubs so that the reel tapes can be changed in seconds as they are finished.

Potter Instrument Company, Inc., of Great Neck, L. I., uses 30 Waldes Truarc Retaining Rings in their new Model 902 High Speed Digital Magnetic Tape Handler. In addition to solving a variety of fastening problems, Truarc Rings facilitate the rapid acceleration and fast stopping needed in these machines.

Wherever you use machined shoulders, bolts, snap rings, cotter pins, there's a Waldes Truarc Retaining Ring designed to do a better, more economical job. Truarc Rings are precision engineered, quick and easy to assemble and disassemble. They save time and increase operating efficiency.

Find out what Waldes Truarc Retaining Rings can do for you, toward saving costs and improving your product. Send your blueprints to Waldes Truarc Engineers for individual attention without obligation.

SEND FOR NEW CATALOG

WALDES

TRUARC

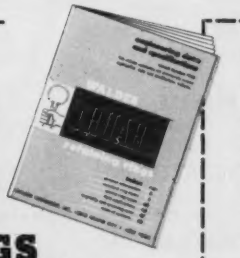
REG. U. S. PAT. OFF

RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING U. S. PATENTS: 2,392,947; 2,392,949; 2,415,852; 2,430,921; 2,439,341; 2,439,785; 2,441,646; 2,458,165; 2,483,380; 2,483,393; 2,487,802; 2,487,803; 2,491,306; 2,509,081 AND OTHER PATENTS PENDING

For precision internal grooving and undercutting... Waldes Truarc Grooving Tool!



MO27

Waldes Kohinoor, Inc., 47-16 Austel Pl., L. I. C. 1, N. Y.

Please send me the new Waldes Truarc Retaining Ring catalog.

(Please print)

Name .....

Title .....

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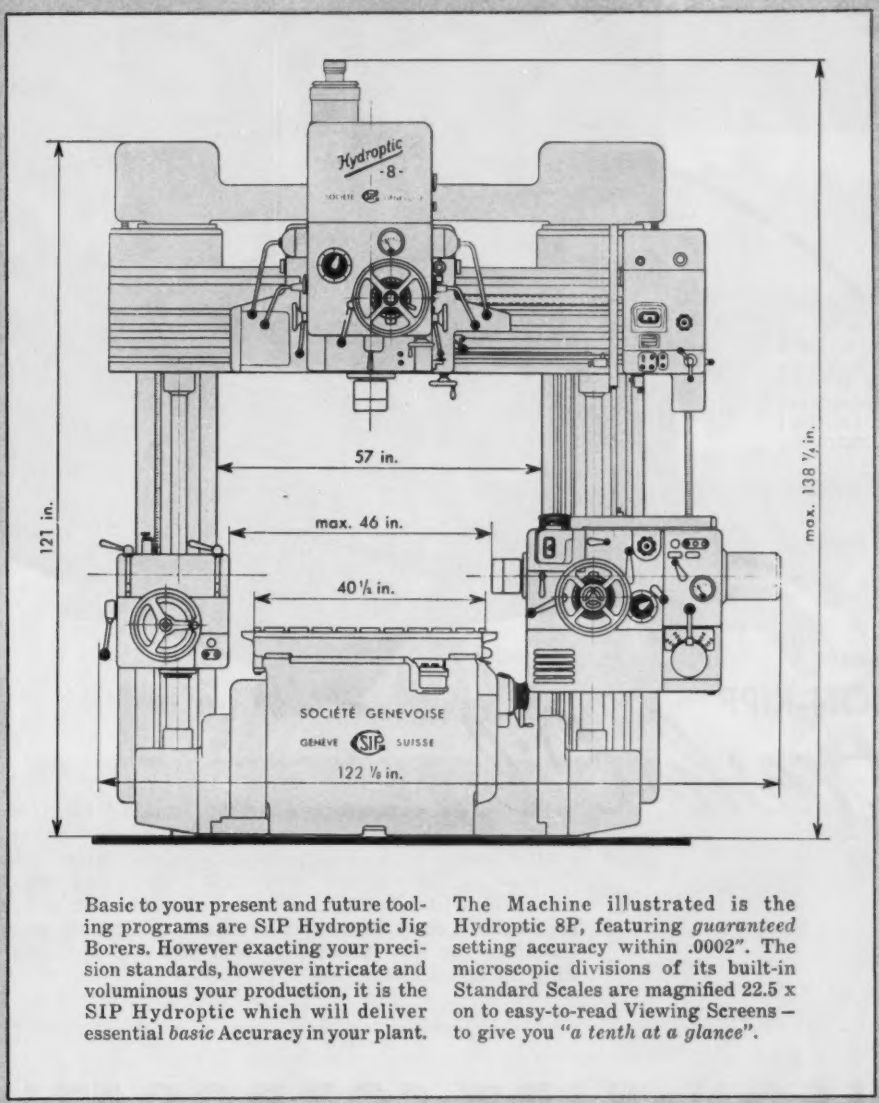
– interested and ready to help you define, establish and maintain the basic high Precision you may need, now and in the competitive years to come.

With it the prototype shop, the toolroom, and therefore the entire plant, are equipped with confidence to produce not merely better work, but more of it and at less cost per unit.

So call in your nearby SIP representative – he's located right in your own manufacturing area, as near as your phone. He'll be glad to cooperate with you.



Basic to your present and future tooling programs are SIP Hydroptic Jig Borers. However exacting your precision standards, however intricate and voluminous your production, it is the SIP Hydroptic which will deliver essential *basic* Accuracy in your plant.

The Machine illustrated is the Hydroptic 8P, featuring *guaranteed* setting accuracy within .0002". The microscopic divisions of its built-in Standard Scales are magnified 22.5 x on to easy-to-read Viewing Screens – to give you *"a tenth at a glance"*.

SIP

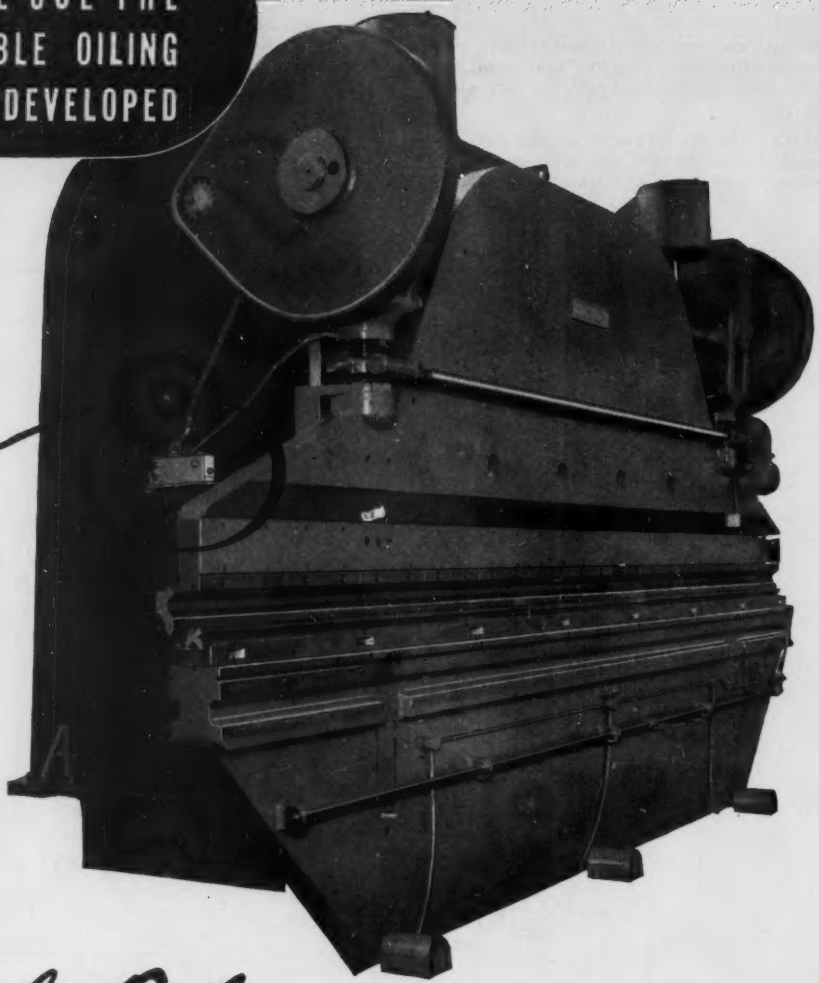
for precision

AMERICAN SIP CORPORATION

100 East 42nd Street, New York 17, N. Y.

High Precision Machine Tools and Measuring Equipment

MACHINES OF GREAT PERFORMANCE USE THE MOST DEPENDABLE OILING SYSTEM EVER DEVELOPED



Illustrated is Madison-Kipp Lubricator Model FD installed as original equipment on a ⅜" by 20' Cincinnati Press Brake, manufactured by the Cincinnati Shaper Co., Cincinnati, Ohio.

MADISON-KIPP

Fresh Oil . . . by the measured drop, from a Madison-Kipp Lubricator is the most dependable method of lubrication ever developed. It is applied as original equipment on America's finest machine tools, work engines and compressors. You will definitely increase your production potential for years to come by specifying Madison-Kipp on all new machines you buy where oil under pressure fed drop by drop can be installed.

MADISON-KIPP CORPORATION

203 Waubesa Street, Madison 10, Wis., U.S.A.

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- *Skilled in* DIE CASTING *Mechanics*
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- *Originators of Really High Speed* AIR TOOLS

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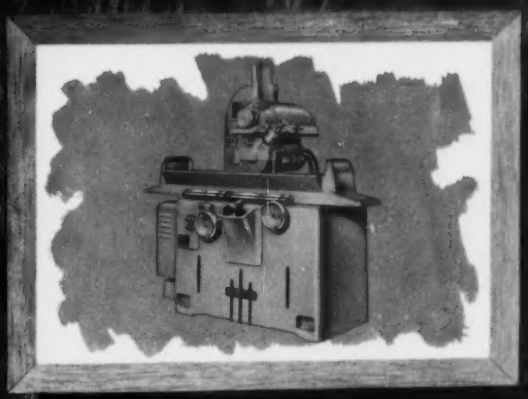
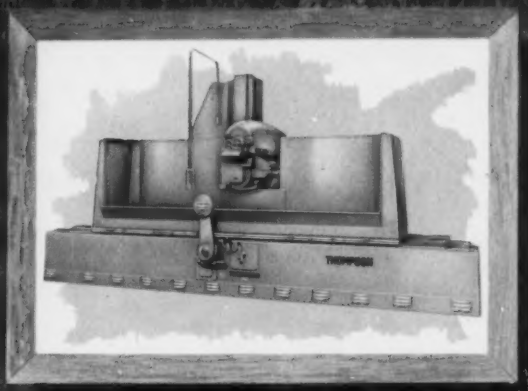
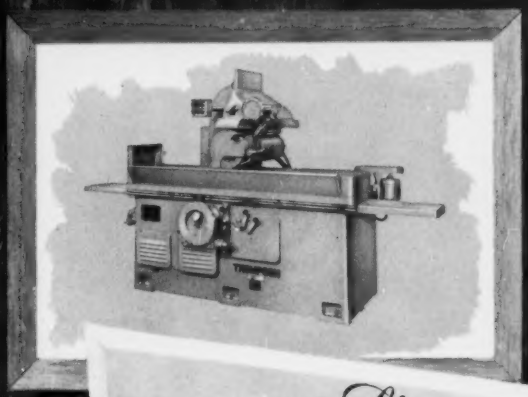
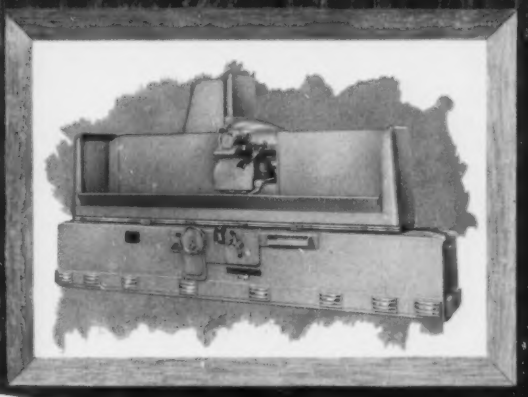








· *Since 1905* ·

Thompson Engineering is responsible for the most complete line of surface grinding machines in the world.

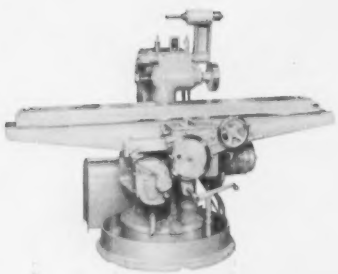
• Standing for precision, ruggedness, economy and adaptability in meeting modern grinding requirements, the name Thompson has won its place as a leader among thousands of satisfied customers throughout the metalworking industry.

Since 1905 under the supervision of Christian Baldenhofer, Thompson Grinders have been developed to meet all types of production problems involving surface and broach grinding. From the small tool room machines to the world's largest surface grinders or the truforming of complex contours by automatic crush-grinding so vital in jet production . . . all of these developments were the results of determination, careful engineering and painstaking research through the years.

Today, The Thompson Grinder Company offers not only the most complete range of types and sizes of surface grinders but a line of machines recognized throughout the world for highest quality and sustained profitable performance.

Thompson Grinder developments

make possible faster more accurate production



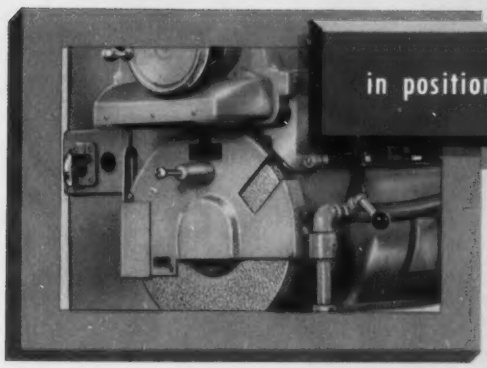
The Original Thompson Grinder
a universal machine . . . and still running

Christian Baldenhofer, Founder (1874-1953)

The resourcefulness and persistence of one man stands out in the fifty years of Thompson achievements in surface grinding. Christian Baldenhofer not only founded a company back in 1905, he established an ideal for honesty, excellence of workmanship and customer satisfaction that has ruled company policies ever since and has been perhaps the largest factor in Thompson's rise to leadership.

For, in producing grinders that not only meet critical job requirements but often exceed expectations . . . in producing grinders that incorporate new operational and control features which enable industry to produce more and better things for less and less . . . in doing all this Thompson has developed a reputation for perfections and economy of performance of which the entire Thompson organization is proud.

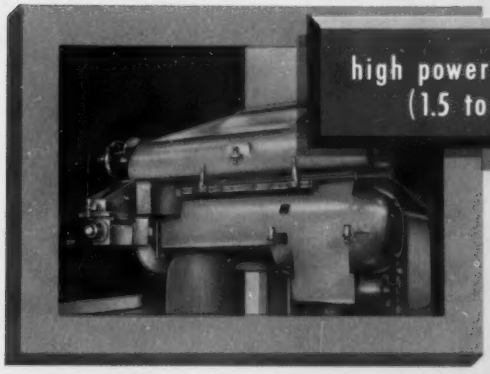
Some of the outstanding Thompson developments in grinding are shown on the opposite page and others are listed on the back page.



in position wheel truing

THOMPSON RUFORMING

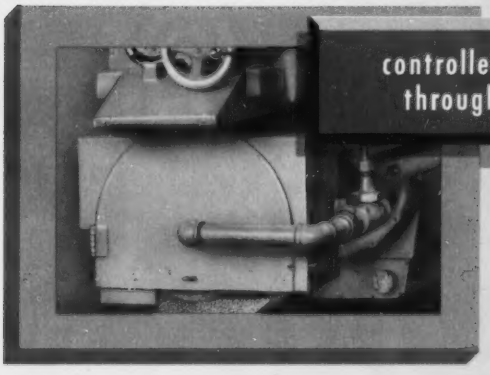
hydraulic rapid traverse



high power wheel heads
(1.5 to 100 hp)

automatic
broach sharpening

wide cross feeds



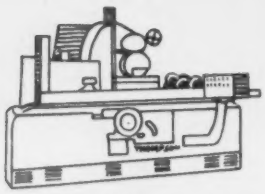
controlled coolant
through wheel

push button wheel truing

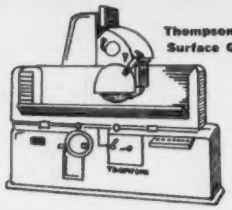
precision elevating screw

centralized control

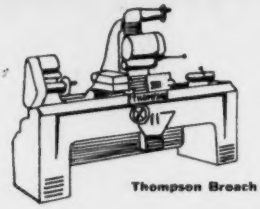
silver bearing spindles
and pressure lubrication



Thompson Truform
Contour Grinders



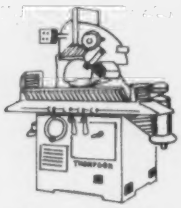
Thompson Type C
Surface Grinders



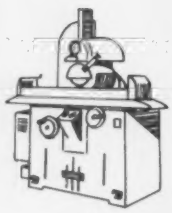
Thompson Broach Grinders

And here is the complete line of Thompson surface, contour and broach grinders...

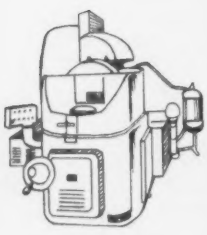
...the only complete range of types and sizes in the world.



Thompson Type B
Surface Grinders



Thompson Type F
Surface Grinders



Thompson Dual
Rotary Grinders

Other Thompson Developments...

The Hydrail Grinder was developed by Thompson to make possible extreme accuracy of grinding the fine surface finish on bed ways of large machine tools. This rail type construction with the advantages of multiple vertical and horizontal wheels, grinding and undercutting simultaneously, has greatly speeded and simplified bed way surfacing.

Thompson also pioneered electric angular wheel truing which insures accurate and smooth truing for fine finish and precision on the work piece.

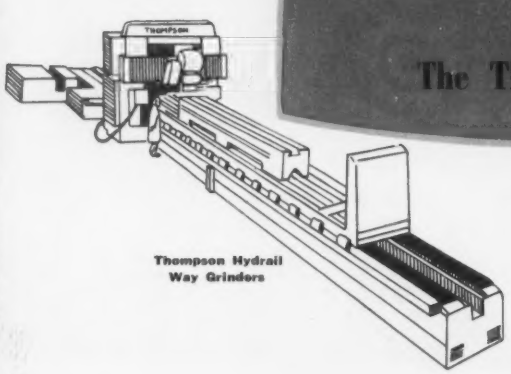
The Hydrovert Grinder with sliding column and vertical spindle is another Thompson development for grinding flat obstructed, multi-level or wide flat surfaces. Thompson has developed Dual Rotary Grinders for high production on such parts as automatic transmission gears, circular saws and housing castings.

A new Drum Rotary Machine has been produced for continuous grinding on overhead valve rocker arms.

These are some of the reasons it will pay you to contact Thompson when you are confronted with surface or broach grinding problems. Perhaps you may find that work may be ground even more efficiently than by another machining method. In any event Thompson Engineers are always glad to consult with you and they are often able to offer constructive suggestions.

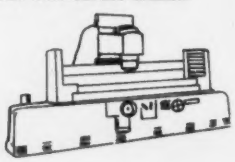
1905 **Thompson Grinders** 1955

The Thompson Grinder Company, Springfield, Ohio

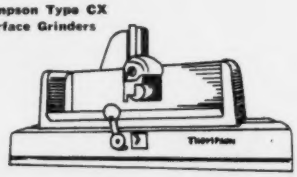


Thompson Hydrail
Way Grinders

Thompson Vertical Spindle
Production Wide-Surface Grinders



Thompson Type CX
Surface Grinders

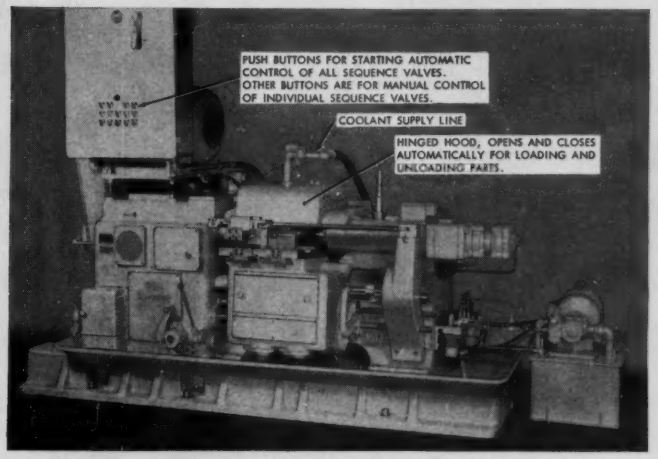


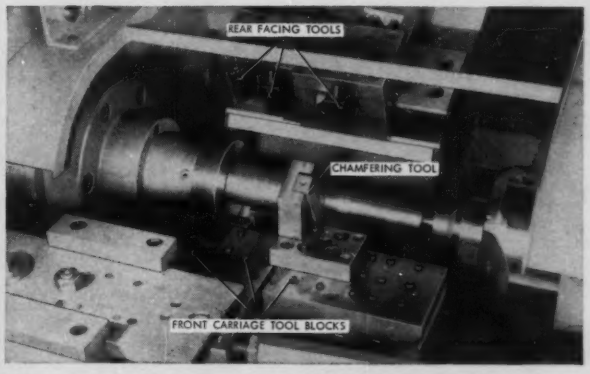
LITHO
IN
U. S. A.

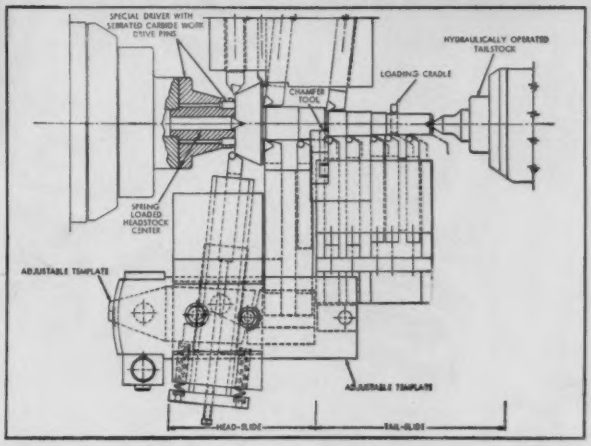
MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK

Hinged hood in open position for loading and unloading parts ▶


PUSH BUTTONS FOR STARTING AUTOMATIC CONTROL OF ALL SEQUENCE VALVES. OTHER BUTTONS ARE FOR MANUAL CONTROL OF INDIVIDUAL SEQUENCE VALVES.
COOLANT SUPPLY LINE
HINGED HOOD, OPENS AND CLOSES AUTOMATICALLY FOR LOADING AND UNLOADING PARTS.





Lo-swing LATHE CUTS MACHINING AND HANDLING TIME ON REAR AXLE DRIVE PINIONS

PROBLEM: To finish turn (from end to end) Rear Axle Drive Pinions in one operation and to reduce handling time to a strict minimum.

SOLUTION: A Model AR Automatic Lo-swing Lathe, equipped with Automatic Controls and Serrated Pin Type Driver was selected for this job. The work piece is driven from the gear end by a special driver fitted with serrated carbide pins which indent the large face of the gear. Indentation is obtained by pressure from the tailstock center which is mounted in a hydraulically operated quill. Two pressures, automatically controlled, are used...a high pressure for forming the indent while the shaft is being loaded between centers and a low pressure during the actual machining operation.

This method of driving the work piece permits the machining of all of the gear and stem diameters as well as the facing and undercutting of shoulders in a single operation. Eight carbide front turning tools, one of which is template operated, reduces the length of cut to 2-3/16". This is the length of cut required for the bearing nearest to the bevel gear. The facing, undercutting and chamfering of shoulders are accomplished with four carbide tools mounted on the rear slide. It should be noted that the template is adjustable to handle bevel gears having different angles.

Handling time and operator fatigue are held to a strict minimum by the use of a loading cradle and automatic controls for placing the part between centers, and opening and closing the hinged hood.

The machine stops at the end of the cycle with the spindle stopped, tailstock center retracted, hinged hood open and with the machined part dropped into the cradle. The operator simply replaces the finished part with a rough forging and then pushes two starting buttons, energizing the loader controls, which consecutively close the hood, place the work between centers, indent for the driver pins and finally start spindle rotation. The automatic cycle from then on is controlled by the automatic camming built into the base machine.

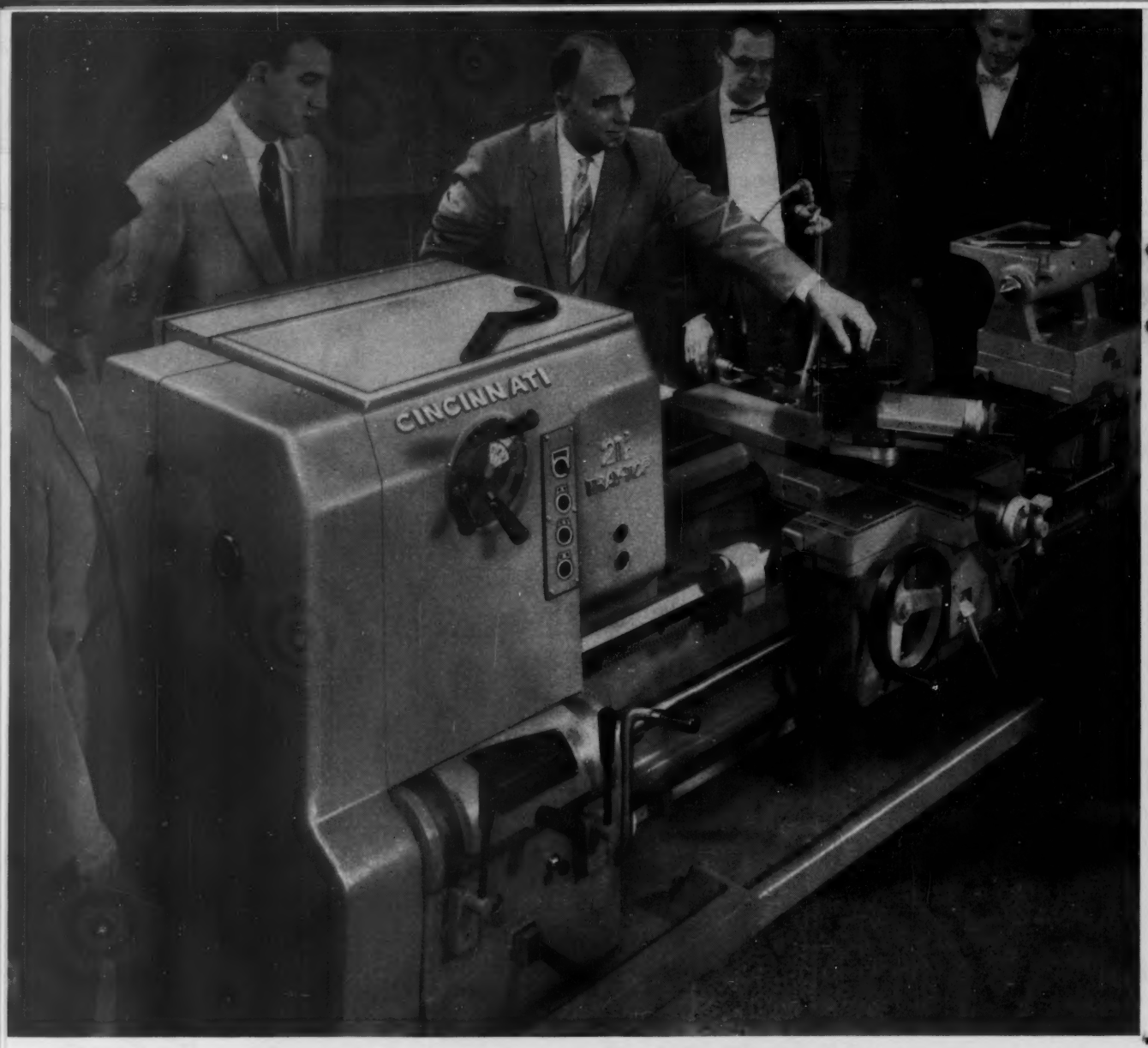
The tooling area of the machine is entirely enclosed to protect the operator from flying chips and coolant while cutting at high spindle speeds. Two starting buttons, wired in series, require the operator to use both hands. They are so located that the operator is out of range of the closing hood, thereby preventing accidents.

Control buttons on the door of the starter panel permit normal operation of individual controls and are convenient for setting up and timing loader movements.

Seneca Falls engineering staff is at your disposal to help solve your production problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH *Lo-swing*



New Low-Cost Cincinnati Lathes Make Debut at Dealer Meeting

Cincinnati's latest lathes—the 21½″ and 26″ Tray-Tops—made their introductory bow October 18 before the expert eyes of 54 dealers. As a team of designers and engineers presented these brand-new babies, here's what these dealers saw and liked:

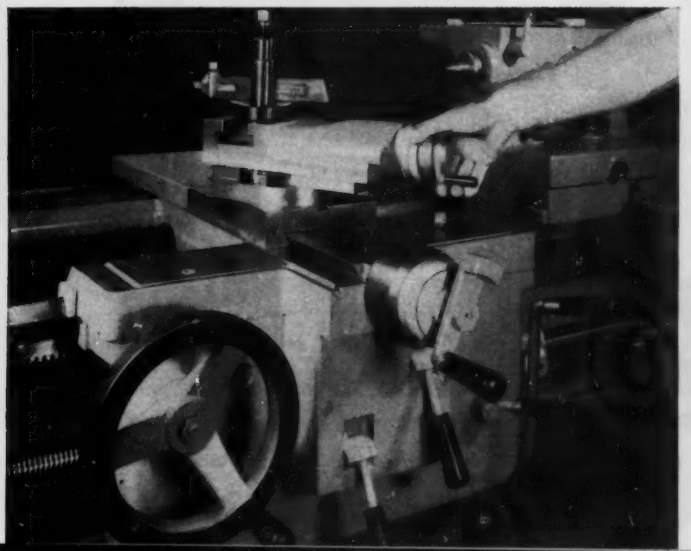
Lathes with 12 all-geared spindle speeds from 24 to 960 rpm in the high range—with 54 thread and feed changes—flame-hardened ways to retain built-in accuracies—Cincinnati's exclusive Color Match Speed Selector—a totally enclosed quick-change box and hardened gears in all three transmissions.

Best of all, they saw lathes priced well within the reach of every shop.

These low-cost Cincinnati Tray-Tops are so new that not all dealers have been supplied with display models. But that needn't keep you from getting the details now. Just write for Catalog T-117 and we'll rush complete descriptive literature. No obligation, of course. Cincinnati Lathe & Tool Co., 3266 Disney St., Cincinnati 9, Ohio, U. S. A.

TOTALLY ENCLOSED QUICK-CHANGE BOX guards gears against dirt, chips and foreign matter. It also provides a built-in oil reservoir for automatic lubrication. 54 thread and feed changes—range of 1½ to 92 threads per inch; range of feeds .0019 to .1215.

APRON is a one-piece, double-walled casting providing adequate support for all shafts. It incorporates a built-in safety clutch, oil shot pump lubrication and positive jaw feed clutches.



COLOR MATCH SPEED SELECTOR is simplicity, itself. No more reference to index plates and lever positions; just match up the color lines. Spindle speeds range from 16 to 640 rpm (standard) or 24 to 960 rpm (high). Pressurized lubrication to bearings and gears. Three-bearing spindle. 2⅞" diameter spindle hole available.

what's so different about

Piercing Color TV Chassis?

Color TV chassis are produced in small lots—require frequent engineering changes—setups and production tools are high cost operations.

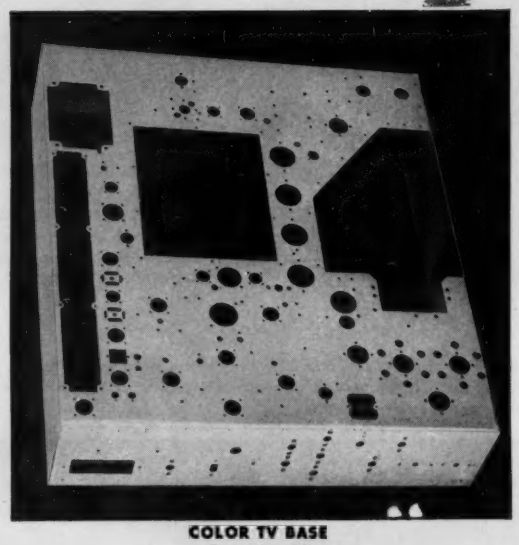
THE WIEDEMANN RA-41P TURRET PUNCH PRESS economically produces chassis and panels in small lots for

COLOR TV
RADAR
FIRE CONTROL
COMMUNICATIONS
BUSINESS MACHINES
AIRCRAFT
and many other applications

because:

- **Setup time is low**
- **Initial tooling cost is low**
- **Punches and dies are re-used on other jobs so tooling cost soon becomes a negligible factor**
- **Engineering changes are accomplished without delay to production schedules and at low cost**
- **Complete flexibility—close hole centers—20 hole sizes in sheets to 28″ x 40″ in single handling —40 to 60 holes per minute located to plus or minus .005″ tolerance**

These advantages combine to make the RA-41P Wiedemann Turret punch press a paying investment to all chassis fabricators, since the RA-41P is the only machine designed for economically piercing electronic chassis and panels in low runs.



COLOR TV BASE
Quantity 55
(Pierced on Wiedemann RA-41P)
530 strokes of press
31 different punches and dies used
(no special tools)
2 handling operations
TOTAL TIME (floor to floor)
per piece 16.25 MINUTES

Write for a copy of Bulletin 241

WIEDEMANN MACHINE COMPANY

4205 Wissahickon Avenue, Philadelphia 32, Pa.

For more information on products advertised, use Inquiry Card, page 241

The story of 5 benefits Wayne Screw Products gets from using STANICUT CUTTING OIL

Plant Foreman Al Ziegman (left) and Standard industrial lubrication specialist L. J. Loomis examine pitch diameter of screw threads. L. J. Loomis' engineering background plus his field experience in industrial lubrication, customers find, pays off *for them.* Lee is a graduate of Tri-State college of Indiana with a B.S. degree. Before entering field work, he completed Standard Sales Engineering School.

STANICUT 137 BC Oil solved finish problem for Wayne Screw Products Company, gave better finish on screw and machined parts like these—plus four other important benefits.

Management at Wayne Screw Products Company, Detroit, found they were not getting a completely satisfactory finish on aircraft quality stainless steel, which the plant was machining. They followed a suggestion made by their Standard Oil lubrication specialist to switch to STANICUT 137 BC Oil. The result: five benefits. (1) Better finish (2) Higher quality work (3) Longer tool life (4) Higher production because of less down time for tool sharpening and adjusting (5) Cutting oil costs reduced approximately 50%.

At first STANICUT 137 BC Oil was used in two automatic screw machines—a National Acme Multi-Spindle and a Brown & Sharp Single Spindle. Production benefits prompted Wayne Screw Products to convert other equipment to STANICUT 137 BC Oil—and with similar results.

Delivering benefits like this is an old story for STANICUT 137 BC Oil. A Standard Oil lubrication specialist will be happy to demonstrate how Standard's cutting oils can perform with similar results for you. In the midwest, a call to your nearby Standard Oil office will bring a prompt response. Or contact: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD

STANDARD OIL COMPANY
(Indiana)

Eliminates 3 costly operations with DENISON® MULTIPRESS

Three time-consuming operations eliminated.

Production doubled.

A better product at less cost.

. . . all because of a switch to Denison hydraulic Multipress.

At The Nye Rubber Company, Barberton, Ohio, the old method for trimming flash from molded rubber wheels required cutting, freezing, tumbling, buffing and washing—with parts loaded and unloaded by hand for each operation. Now, a 4-ton Multipress trims flash automatically.

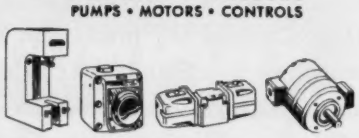
The operator simply loads parts, which are carried under the ram by a Denison Index Table. One smooth hydraulic stroke trims the flash neat and close. Air blows the finished product down a chute for packing. The rate for one operator: 2400 parts an hour.

A switch to Denison Multipress could cut costly operations in your plant. Write for cost-cutting ideas and technical bulletins.

THE DENISON ENGINEERING COMPANY
1244 Dublin Road • Columbus 16, Ohio

DENISON Hydr**OIL**ics

HYDRAULIC PRESSES
PUMPS • MOTORS • CONTROLS



For more information on products advertised, use Inquiry Card, page 241

What do you think?

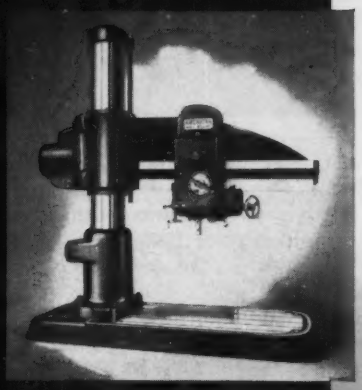
This standard 32-speed "AMERICAN" Hole Wizard Radial Drill head, in combination with a special drilling machine, has just completed the machining of 175,000 work pieces. The operations consisted of 6" diameter spot facing, drilling 5 holes ranging from 1.45" to 5" in diameter, step boring 3 holes ranging from 2.25" to 5" in diameter, two recessing operations and tapping 2.25" diameter holes.

In completing this job the tapping attachment frictions were engaged and disengaged well in excess of 1,000,000 times.

This entire operation was completed without one minute's down time and without maintenance or repair.

Although we have no data to substantiate this, we believe this *must* be some sort of a performance record.

What do you think? . . .



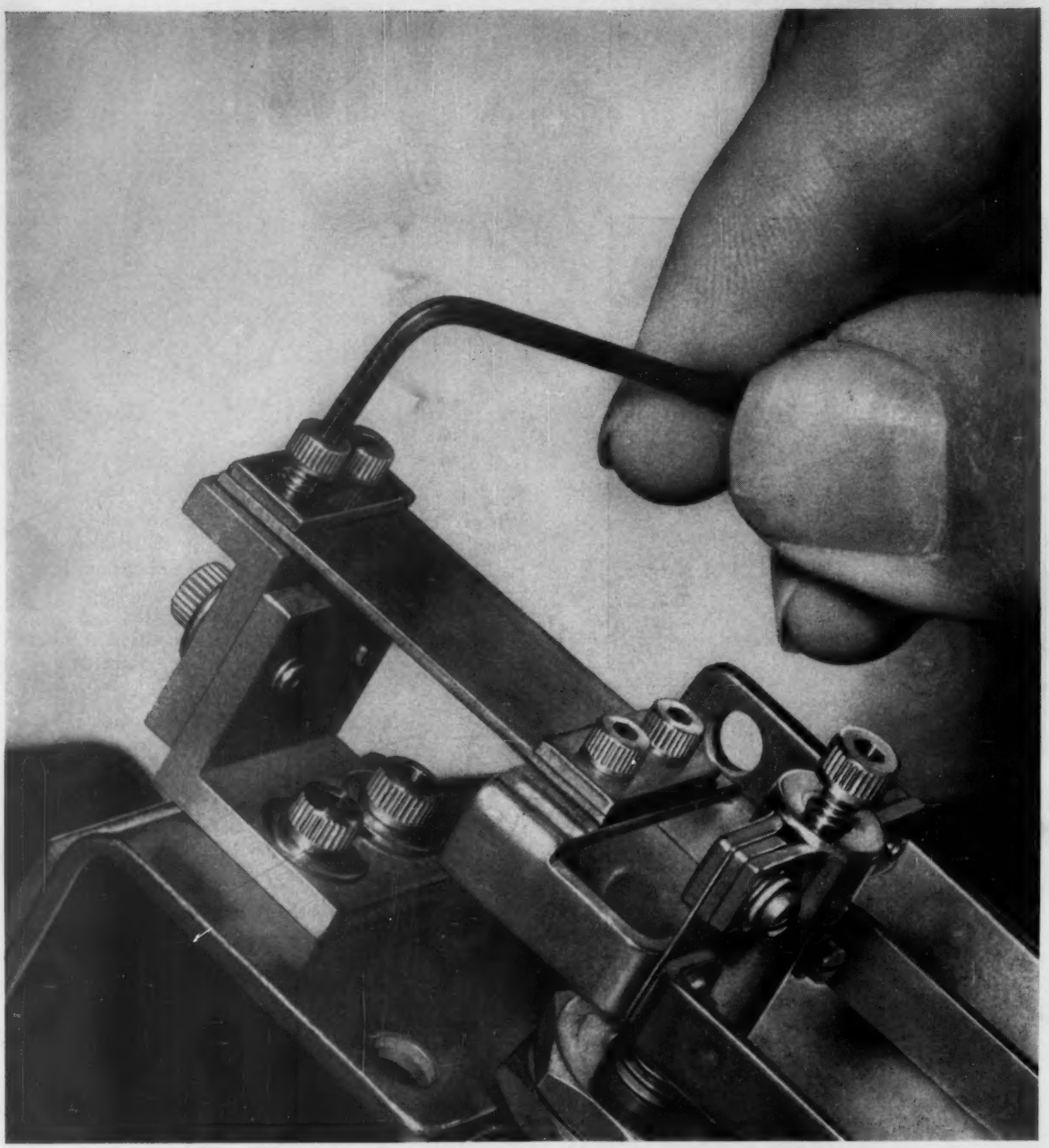
This is exactly the same type of head you get when you install a 32-speed "AMERICAN" Hole Wizard. What better guarantee of service could one ask than this performance record? This is the kind of service that has built "AMERICAN" prestige and preference and accounts for its world-wide reputation for top quality.

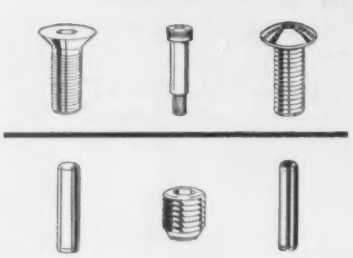
The many reasons contributing to "AMERICAN" Hole Wizard predominance are clearly illustrated and described by bulletin No. 327. May we send you one?

THE AMERICAN TOOL WORKS CO. **Cincinnati 2, Ohio, U. S. A.**

LATHES • RADIAL DRILLS

UNBRAKO AT WORK





MINIATURIZATION. Small socket cap screws make possible smaller instruments. UNBRAKO Micro Socket Cap Screws range in size from #0 to #3, from ⅛" to ½" in length. But they have much more than microsize to recommend them. They are so strong that three UNBRAKOS will do the job of five ordinary cap screws. Or, if you must use the same number of screws, you can safely use smaller UNBRAKOS. All UNBRAKOS have knurled heads for easier handling and faster assembly, and uniform sockets for maximum wrench engagement. Your favorite industrial distributor always stocks UNBRAKOS. STANDARD PRESSED STEEL CO., Jenkintown 19, Pa.

UNBRAKO® SOCKET SCREW DIVISION SPS JENKINTOWN, PENNSYLVANIA

For more information on products advertised, use Inquiry Card, page 241

ASSEMBLE THE TYPE OF GAGE YOU NEED
. . . with Rectangular or Square Gage Blocks

The DoALL Micro-Step Gaging System enables you to quickly assemble gages, accurate to millionths, for use *in the toolroom and shop* as well as in the lab or inspection department. This inexpensive system will reduce errors and rejects, and eliminate many costly special gages . . . saving time and money. . .

DoALL
The DoALL Company
Des Plaines, Illinois

turn the page for more details.

Everything for Dimensional Quality Control

DoALL MICRO-STEP GAGING SYSTEM

Here is the means for directly applying gage blocks to thousands of precision measurement jobs which previously could be checked only with less accurate gaging setups.

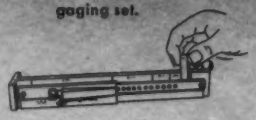
—the means for securing micro-inch accuracy on inside as well as outside measurements.

—the means for making pin gages, snap gages, indicating gages, height gages, depth gages, go and no-go gages for use in all gaging operations.

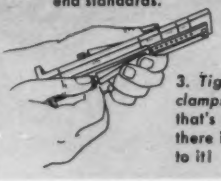
Keys to the system are the new DoALL Gage Holders and End Standards with full exposed measuring surfaces. No other gage system offers such a combination.

Ask for literature on Micro-Step, DoALL rectangular blocks and NEW SQUARE BLOCKS.

1. *Select end standards* from Micro-Step gaging set.



2. *Assemble* — place blocks into channels; snap pins through end standards.



3. *Tighten clamps*— that's all there is to it!

Internal indicating pin gage.

Go and no-go gage.

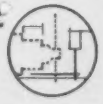
Height gage with scriber.

Indicating comparator gage.

OPTICAL INSPECTION

Bausch & Lomb Optical Comparators, sold exclusively by DoALL, permit quick visual check of parts to "tenths." Also Toolmaker's Microscope, Stereomicroscopes, Shop and Brinell Microscopes, Contour Measuring Projectors, etc. Ask for Catalog.

With DoALL monolights and optical flats you can "see" millionths of an inch variations in flatness, size and parallelism. Optical flats from 1" to 10".

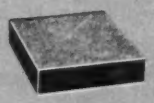


Charts and fixtures made to order for optical inspection work.

Square and round optical flats.

REFERENCE INSPECTION

Granite and steel surface plates, V-blocks, parallels, angle plates and straight edges.



Handy Working Flat 8" x 12" x 2", .0002" surface accuracy... only $22.50.

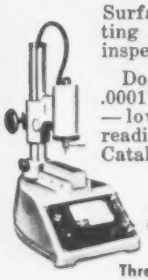
DoALL granite surface plates, parallels, flats and V-blocks are of the densest, strongest, least absorptive granite available.

Harder than tool steel; velvet smooth; easily cleaned; accuracy to plus .00005" minus .0000"! The finest available.

COMPARISON INSPECTION

Surface roughness scales, comparators, setting discs, plug and ring gages — to speed inspection and assure accuracy.

DoALL Producto-Chek Comparator with .0001", .00005" and .000010" gaging heads — low cost — extreme accuracy — direct reading — no gears, levers, racks. Ask for Catalog.



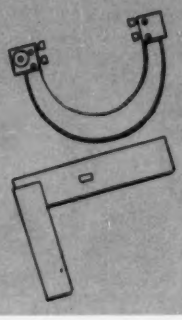
Electrical Comparator

Producto-Chek

Thread and Cylindrical Plug and Ring Gages

MECHANICAL INSPECTION

Light weight hollow frame micrometers for faster work, less fatigue, better balance. Standard and special micrometers of all kinds. Snap gages, dial indicators, height and depth gages, squares, scales, calipers . . . and many more. All available at your DoALL Store.



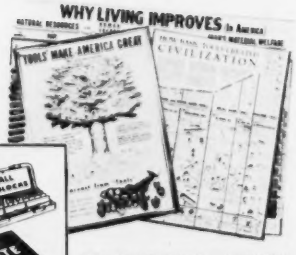
DoALL

Make DoALL your inspection equipment headquarters. Ask for literature and free demonstrations. Call your local DoALL Store . . . listed in your classified phone directory . . . or write The DoALL Company.

Friendly DoALL Stores . . . (in 40 cities)

Personalized Service . . . Complete Stocks . . . Local Delivery

Call Your DoALL Service-Store
DoALL SAW BANDS
DoALL GAGE BLOCKS
DoALL GRANITE PLATES
Machine Tools • Cutting Tools • Measuring Instruments
Shop Supplies • In Stock
The DoALL Company, Des Plaines, Ill.



EDUCATIONAL STUDY WALL CHARTS

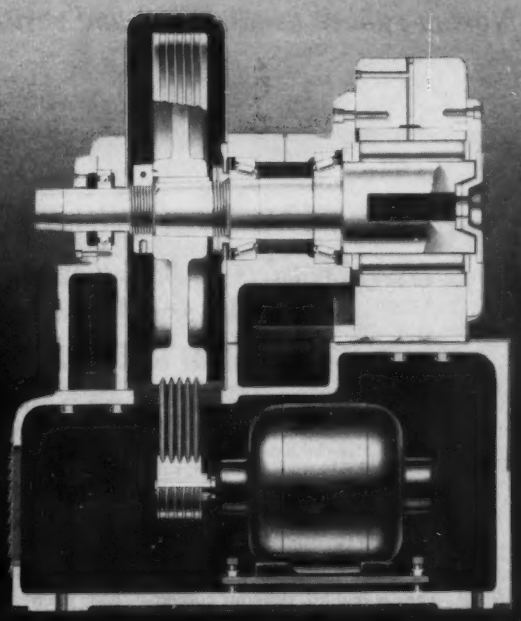
Economic Principles

$1.00 each postpaid

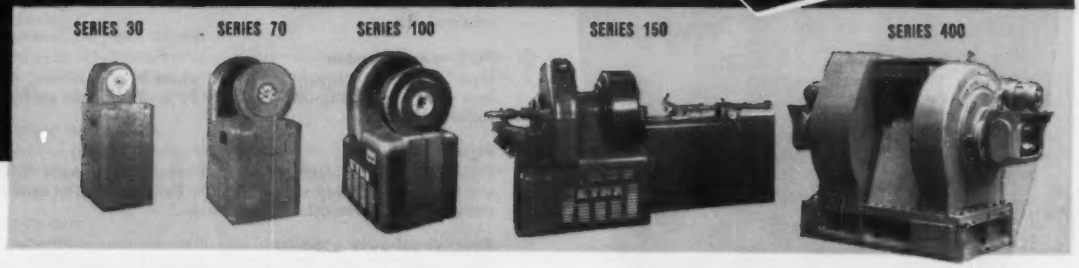
Lower quantity prices.

IF IT'S SWAGING... It's Etna..

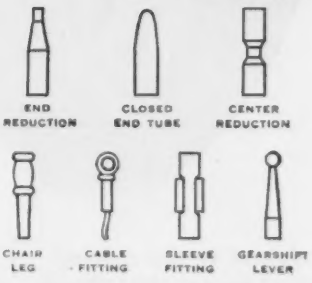
FOR CONTINUOUS PRECISION PRODUCTION!



A COMPLETE RANGE OF SIZES AND CAPACITIES



For tapering, sizing, reducing and forming to special shapes of round solids and steel tubing, the Etna Swaging Machine offers the ultimate in modern machine design. Regardless of size and description of the job to be done, there's an Etna swager right for *greater production*. Write today regarding your specific job problems.



It's New! Get full information on the blending into the wall of I. D. Bead on steel and stainless steel tube with Etna Swagers resulting in mirror finish. Bead also removed on conduit.

Abbey ETNA Company

3422 MAPLEWOOD AVE., TOLEDO 10, OHIO

Users tell you how

These two cut-off

On-the-job reports prove the Norton rubber bonded R50 and resinoid bonded

For wet cutting

Users' reports on how the Norton R50 adds the profit-boosting "TOUCH of GOLD"

- **Wheel life tripled**
  Massachusetts tool manufacturer says R50 wheel, cutting-off high speed steel tap stock, lasted three times as long as best competitive wheel. Job required very smooth cut, with no burr or burn.
- **Best in every way**
  Illinois maker of combination doors and windows reports R50 wheel produced best quality cut, fastest cutting action, longest life for cutting extruded aluminum frames.
- **Longer lasting, superior cutting**
  Rhode Island oil seal manufacturer reports R50 wheel, cutting-off stainless steel, gave considerably longer life with better quality cut than any other wheel.
- **70% more durable**
  New York steel company says R50 wheel beat durability records of two best previous cutting-off wheels by 70%. Work was on high speed and carbon tool steels.
- **First among four**
  Pennsylvania manufacturer of coal mine bits reports R50 best wheel used for cutting alloy steel bit stock. Far superior, in quality of cut and durability, to three other wheels tried.
- **Best wheel ever used**
  New Jersey sporting goods manufacturer, using R50 for cutting off tubing for golf club shafts, rates this wheel far above all others for performance and economy.

The Norton R50 rubber bonded cut-off wheel is designed especially for wet cutting of ferrous bar stock up to 6" diameter. It is the wheel to use where quality of cut, without burning, is important. Built-in chip clearance — unusual in this type of wheel — is one of many "Touch of Gold" advantages for better cutting performance and longer wheel life.

Is wet or dry cutting best for YOU? — Ask your Norton distributor

Are your cutting-off jobs marred by excessive burring or burning? Are you case-hardening the work, so that it causes tool breakage? Are you wearing out your wheels too fast on high production runs? Are you looking for finished cuts — and not getting them?

If you're bothered by any of these cutting-off problems, perhaps you ought to check your methods as well as your wheels. You may, for example, be dry cutting, when wet cutting would be more efficient — or vice versa.

Your Norton Distributor's abrasive specialist, or your Norton Abrasive Engineer is ready to give you practical information on cut-off *methods* — information that can save you money every day.

See your Distributor, or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone directory yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

wheels top all others

B9 wheels save time and money on the widest range of wet and dry applications

For dry cutting

Users' reports on how the Norton B9 adds the profit-boosting "TOUCH of GOLD"

- **Five times better**
  California naval shipyard re-orders B9 wheel for aluminum cutting jobs. Reason: B9's 5 to 1 superiority over best previous wheel.
- **100% more cuts**
  New Jersey foundry switched to B9 wheels for cutting "Christmas tree" risers from precision castings, after tests in which B9 gave twice as many cuts.
- **Gave a 10 to 1 advantage**
  Indiana tool company praises B9 wheel as easily the best ever run for cutting-off miscellaneous hardened tools, delivering a 10 to 1 advantage over best of competition.
- **Best general purpose wheel**
  Massachusetts manufacturer of molded rubber products reports the B9 best all-around cut-off wheel in their experience. Chief jobs were cutting various types of steel up to 3" diameter.
- **Unbeatable on Inconel**
  Pennsylvania bearings company says it found no other wheels to compare with the B9 for cutting Inconel bar stock. Outperformed competitive wheels on all counts.
- **565 more cuts**
  Massachusetts manufacturer of textile equipment reports B9 wheel produced 700 cuts on 1 x ½ x ⅛" steel channels. This topped previous wheel's record of 135 cuts by 565 — for five times longer wheel life.

The Norton B9 resinoid bonded cut-off wheel is recommended for high production dry cutting jobs, especially where fast rate of cut is essential. It is made with either smooth sides or the rough "F" sides for more clearance in the cut. It will give you long, economical "Touch of Gold" performance in the widest range of ferrous and non-ferrous applications.

Making better products . . . to make your products better

NORTON

and its BEHR-MANNING division

NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

W-1600

For more information on products advertised, use Inquiry Card, page 241

IN this cost-conscious era of close competition, there is a constant search for methods to reduce manufacturing costs. One way this is being accomplished by manufacturers of refrigeration equipment . . . is by making full use of the Microhoning process on vital functional surfaces of parts such as the bearing plate, crank case, main frame, front head casting, connecting rod, cast-iron housing, cylinders, pistons, and various small bushings.

What is Microhoning and how does it reduce manufacturing costs?

Microhoning is an abrading process that combines stock removal, geometric accuracy, size control and surface finish into one automatic operation. The rotating and reciprocating, automatically-expanding tool self-dresses its abrasives through its own motions, while faithfully duplicating the required surface finish.

The savings are in time, effort and equipment required to obtain comparable results by any combination of other means. Why not have a Micromatic Field Engineer discuss with you the advantages of Microhoning in your processing plans?

Write today for *Cross-Hatch* Vol. 6—No. 4

MICROMATIC HONE CORPORATION

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MICRO-MOLD MFG. DIV.
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REPRESENTATIVES: Allied Northwest Machine Tool Corp., 103 S.W. Front Ave., Portland 4, Oregon • Mason Machine Tool Company, 415 So. Second East, Salt Lake City, Utah • Tidewater Supply Co., Charlotte 4, North Carolina
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REPRESENTATIVES IN ALL PRINCIPAL COUNTRIES

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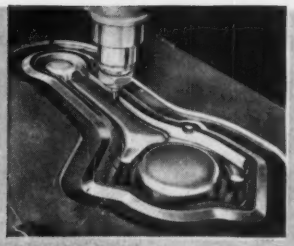
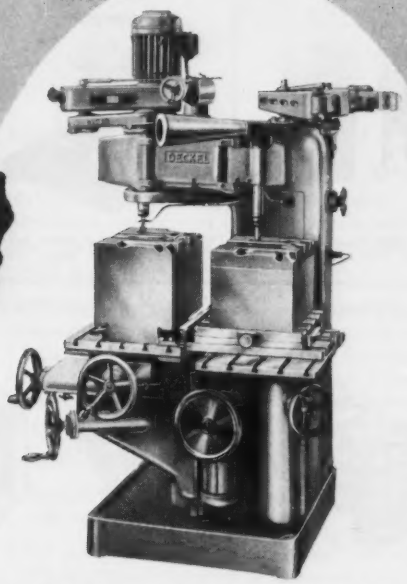


ECONOMICAL, ACCURATE PRODUCTION OF DIES AND MOLDS WITH THE LATEST

DECKEL

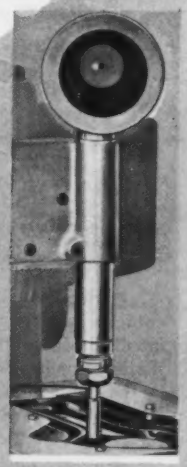
universal pantograph DIE SINKING MACHINE model KF12

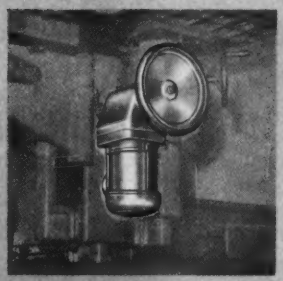
Deckel die sinking machines are justly famous for their accuracy, production rate, and ease of operation. The KF12, latest and largest Deckel model, does heavy die-sinking jobs which formerly required much greater investment in equipment. Spindle speeds from 60 to 10,000 r.p.m. enable you to do rough and finish milling, as well as light engraving, on the same machine. The newly developed, "mirror image" milling attachment produces right and left hand dies and molds from the same pattern. Other important features are illustrated below.



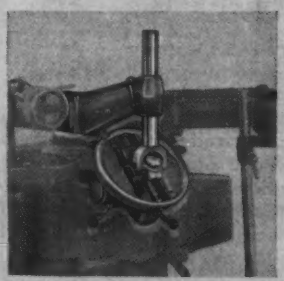
Deckel KF12 makes rapid, accurate enlargements or reductions from 1:1.5 to 1:4 as well as 1:1 duplication. The cutting tool covers an area up to 15¾" x 15¾" or up to 10" x 19¾".

Optical contacting device makes rough milling faster, more accurate. And, accurate rough milling reduces time for finishing.





Saddle elevating motor rapidly raises or lowers master and workpiece at the same time.



Circular forming attachment permits generating spherical shapes.

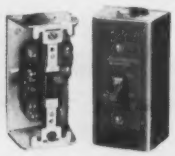
Get in touch with us soon for information on this or other Deckel machines: 2-DIMENSIONAL ENGRAVERS • 3-DIMENSIONAL ENGRAVERS; UNIVERSAL MILLERS • UNIVERSAL TOOL & CUTTER GRINDERS

COSA — *nationwide sales and service of precision machine tools —from bench lathes to boring mills.*

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N. Y.

ALLEN-BRADLEY QUALITY MOTOR CONTROLS
DEPENDABLE–TROUBLE FREE

FRACTIONAL HP STARTER
With Overload Breaker



Bulletin 600—Overload protection for your small motors.

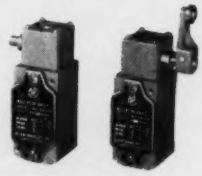
MANUAL STARTER
Across-the-Line Type

Bulletin 609—Most popular hand operated motor starter.

MANUAL STARTER
Watertight Enclosure

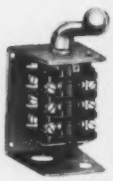
Bulletin 609—For installations exposed to moisture conditions.

OILTIGHT
LIMIT SWITCHES



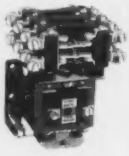
Bulletin 802T—Limit switches with various operating levers.

DRUM SWITCHES



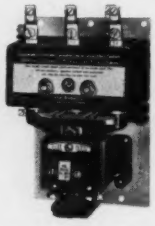
Bulletin 353—Drum switches Master—Transfer—Instrument.

SOLENOID RELAY
A-C Universal



Bulletin 700 BX—Changeable from N.O. to N.C. contacts.

SOLENOID CONTACTOR
50 Ampere Rating



Bulletin 702—Contactors available up to 900 amperes.

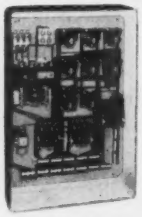
PLUGGING SWITCHES
for Quick Stops

Bulletin 808—Zero speed switch for quick motor stoppage.

SOLENOID STARTERS
Sizes 00 to 7, Inclusive

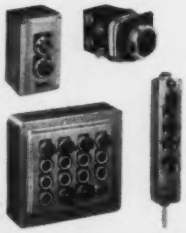
Bulletin 709—Most popular across-the-line motor starter.

CONTROL PANELS
for Sequence Control



Typical Allen-Bradley panel for machine tool control.

PUSH BUTTONS



Bulletin 800-800T—Over 800 styles and types of controls.

A-C SOLENOIDS

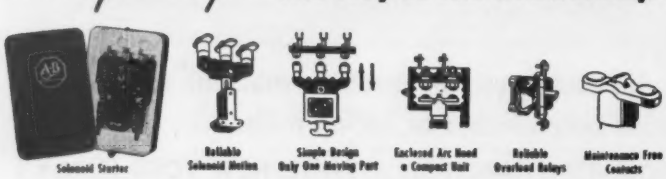
Bulletin 860—A-C Solenoids 9 sizes—25 & 60 cycles.

• Here are starters, contactors, relays, and pilot controls for all types of motorized machines and equipment. These controls . . . and many more are listed in the latest Allen-Bradley Handy Catalog.

The heart of the Allen-Bradley line is the time-tested, constantly improved Allen-Bradley solenoid starter. It has maintenance free, double break, silver alloy contacts. Its simple one piece solenoid mechanism is trouble free. For quality motor controls, recommend, specify, and install Allen-Bradley controls.

Allen-Bradley Co., 1331 S. First St., Milwaukee 4, Wis.

Simplicity—The Key to the Leadership Position of Allen-Bradley Starters



ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

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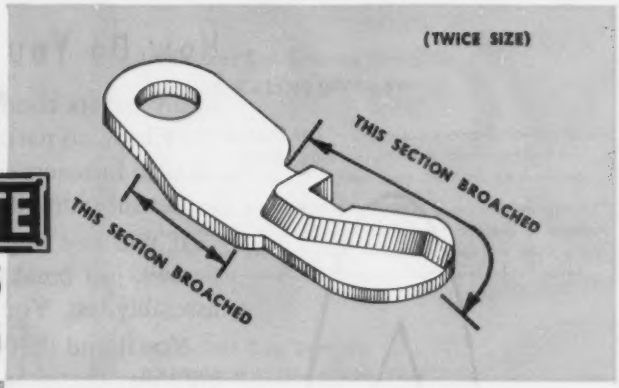
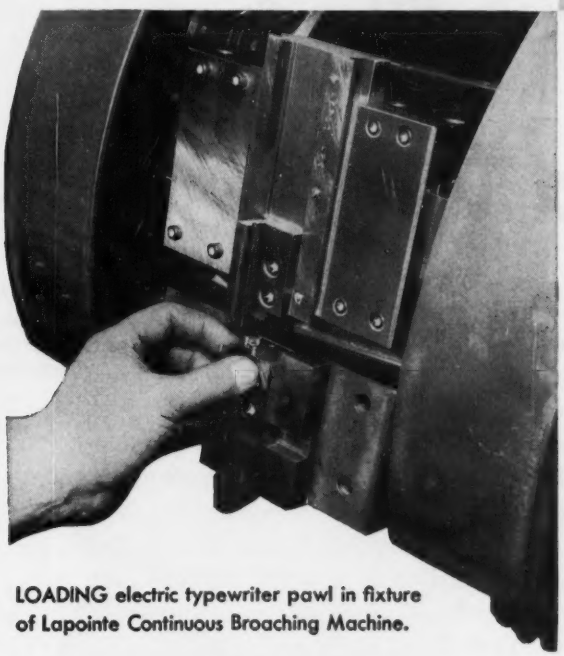
here's a good example of what can be done by LAPOINTE CONTINUOUS BROACHING





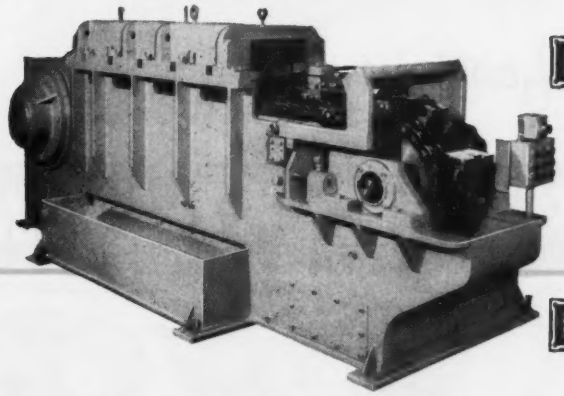
LOADING electric typewriter pawl in fixture of Lapointe Continuous Broaching Machine.

electric typewriter pawl

Contours broached on opposite sides simultaneously, leaving *machined surfaces* of fine finish . . . and to precision tolerances . . . *at a production rate of 800 and more per hour!* This is high production for so small a part, so awkward to load.

THINK of the parts, small or large, that you may now be machining by less economical methods. Then send for the new Lapointe **Bulletin CH-1** and learn more about the superior features of the Lapointe Continuous Broaching Machine. Here are a few:

- Massive, sturdy construction.
- Extra rigidity results in remarkably smooth operation, with no evidence of vibration.
- Full electric interlock instantly stops machine if parts are improperly loaded or clamped.
- Shear pin will sever and protect tools if undue strain develops, or if any other evidence of malfunctioning appears. (Pin is easily accessible, on outside of machine.)
- Drive sprockets are made in pie-shaped segments, removable one at a time, making complete replacement possible — if necessary — without removing drive chain or fixtures from the machine.



LAPOINTE **CONTINUOUS BROACHING MACHINE**
Available in 4 standard sizes
10 hp. 42-inch stroke
20 hp. 66-inch stroke
30 hp. 90-inch stroke
40 hp. 120-inch stroke

Any desired combination of horsepower, stroke, and speed can be obtained.

LAPOINTE **BUILDS THE MACHINE**
BUILDS THE FIXTURES
AND MAKES THE TOOLS

Lapointe takes *all* the responsibility for your CONTINUOUS BROACHING program!

THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.
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HUDSON LAPOINTE MASS

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

How Do You Buy Socket Screws?

Many buyers continue to specify some one make by *habit*. They have no particular preference for it, but they think of *all* such fasteners simply as "screws with hex sockets" — *all* makes substantially *alike*.

If you buy that way, and have never tried P-K Socket Screws, just break the habit once, and give them an actual assembly test. You'll get a pleasant surprise.

You'll find that the hex shape of the socket is about the *only* way that other makes and P-K are "alike".

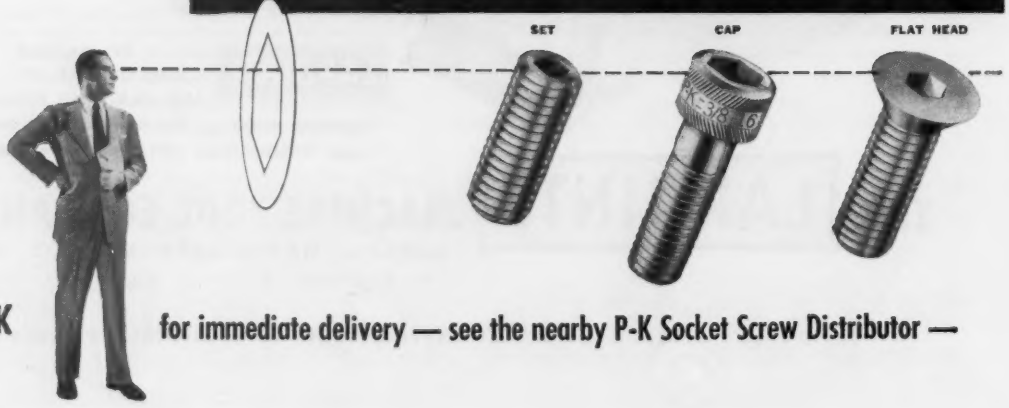
Look Beyond the Hex ——

It pays to *look beyond the socket* when you buy Socket Screws. Compare every detail of product and service. You'll find P-K Socket Screws take top rating in every test. You get exclusive features that simplify and speed up assembly. You get quality matched to a firm guarantee. You get planning and buying information exactly patterned to your needs.

You need *all* these essentials for cost-wise assembly. Why miss out on *any* of them? Just try P-K Socket Screws. Get samples from your P-K Distributor, or write: Parker-Kalon Division, General American Transportation Corporation, 202 Varick St., New York 14.

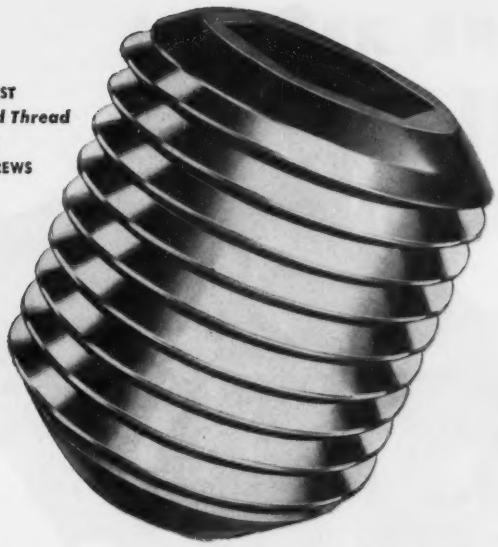
for all the essentials of cost-wise assembly

PARKER-KALON®



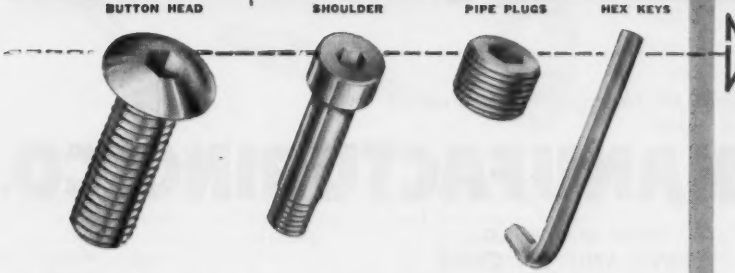
IN STOCK for immediate delivery — see the nearby P-K Socket Screw Distributor —

THE FIRST
Ground Thread
SOCKET
SET SCREWS



THE ONLY
Size-Marked
SOCKET
CAP SCREWS

SOCKET SCREWS



your local Supply and Service Specialist

In Socket Set Screws PARKER-KALON gives you

- **GROUND THREADS** — at no extra cost. Gage-like precision, mirror-smooth finish — uniform, dependable Class 3 tolerance. Mechanics like their easy starting, easy keying.
- **PROVED ASSEMBLY STRENGTH** The "proving ground" is the millions of assemblies made by thousands of satisfied users of P-K Socket Screws, whose products are used everywhere, many under the toughest conditions of vibration.

In Socket Cap Screws PARKER-KALON gives you

- **SIZE-MARK** — offered only by P-K. Incised on the head of each screw, it saves time and wasted screws when sizes get mixed up, prevents errors by green help. Maintenance and service men like Size-mark, it helps in reassembling.
- **GEAR GRIP** Meshing firmly with finger tips, it prevents slipping and fumbling when hands are oily, speeds starting.
- **MAXIMUM STRENGTH** Head, socket, and threads are accurately formed by Parker-Kalon's cold-pressure process. Steel structure "flows" to conform to all contours, assures maximum strength at points of greatest stress.

In all Socket Screws PARKER-KALON gives you

- **GUARANTEED FIRST QUALITY** Based on tests and inspections at every step in production — an exacting routine of quality control supervised by P-K laboratory Technicians.
- **FULL RANGE OF STYLES AND SIZES** You'll find any Socket Screw you need, NC or NF, in P-K's complete line, and Hex Keys in all sizes, and in several handy sets. Ask your P-K Distributor for the P-K Price List, Catalog, — any information you need. Slide chart Socket Screw Dimension Finder Free.

AJAX

FORGING MACHINERY

FORGING
BETTER PARTS
FOR TODAY'S
FINE CARS

A
Complete Line
of
FORGING PRESSES
FORGING MACHINES
and
FORGING ROLLS
To Meet The Needs
of
The Forging Industry

— write for Descriptive Literature —

THE *Ajax* MANUFACTURING CO.

EUCLID BRANCH P. O.
CLEVELAND 17, OHIO

110 S. Dearborn St.
CHICAGO 3, ILL.

W. P. WOOLDRIDGE CO.
1209 Burlingame Ave.
BURLINGAME, CALIF.

6440 Fleet St.
LOS ANGELES 22, CALIF.

Dewart Building
NEW LONDON, CONN.

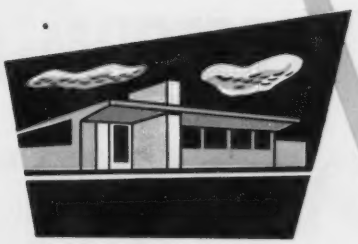
For more information on products advertised, use Inquiry Card, page 241

MUELLER BRASS CO.

FORGINGS

ARE MADE TO LAST!

QUALITY PARTS AND PRODUCTS FORGED AND MACHINED OF BRASS, BRONZE AND ALUMINUM OR MAGNESIUM



IN THE HOME

IMPELLER DISPOSER

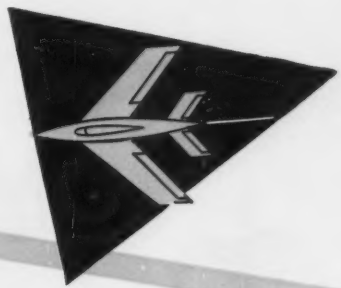
One of four Mueller Brass Co. parts in modern waste disposal unit. Completely dependable in daily operation.

WINDOW HARDWARE

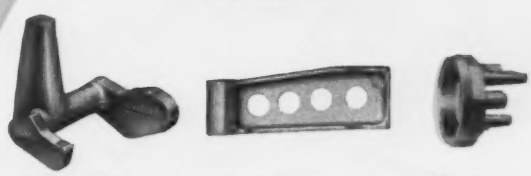
Forged of natural bronze. Can be furnished in aluminum or chrome finish as desired. Retains original beauty indefinitely.

BURNER HEAD

Forged of aluminum for installation in gas stove. Lightweight yet strong.



IN AVIATION



LANDING GEAR TORQUE ARM

SUPPORT MEMBER

INSTRUMENT HOUSING

These aluminum forgings provide the same strength as steel yet weigh only 1/3 as much. Smooth bright surfaces save machining time and eliminate costly finishing.

Specially designed forged housing for sealing diaphragm in aviation pressure warning unit.

IN INDUSTRY

CONNECTING ROD

Forged from "600" series metal. Over two million connecting rods produced without recorded failure.

ACTUATING GEAR

Forged from special Mueller Brass Co. alloy. Must take constant pounding.

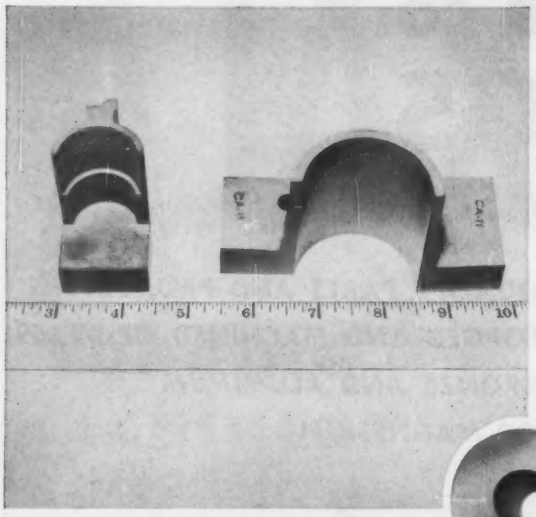
AUTOMOTIVE GEAR

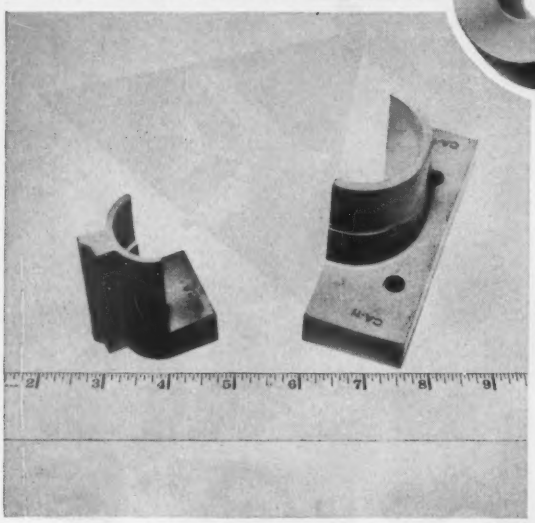
Forged of "600" series metal for use in automotive automatic transmission. Replaced part that was giving constant trouble; solved costly problem.

All Mueller Brass Co. forgings, of which just a few are shown here, have a dense, close-grained structure with a high tensile strength. Weight savings up to 40% are possible in the design of parts because of the close tolerances to which they can be produced. Less scrap and longer tool life result from the easy machinability of forged parts. Mueller Brass Co. is completely equipped to design parts for your products, specify alloys (including special alloys developed by our metallurgists), forge, machine, finish and plate the parts and perform all necessary assembly operations. Write today for our free illustrated 32-page forgings catalog and complete information about MBCo forged parts for your products.

140

MUELLER BRASS CO. PORT HURON 35, MICHIGAN





Look How You Can Save with PREFORMED CARMET®

DIE SECTIONS

these Blanks are preformed to a Finishing Allowance of .018"-.022" per side

These tungsten carbide die sections are of Carmet CA-11, a special grade developed expressly for punches, dies, and other heavy shock applications where wear and abrasion resistance are required.

These blanks have a span of 1.315" with a wall thickness of only .046", but they were easily produced to close tolerances by AL's precision preform methods. All surfaces are clean, smooth and free from defects, requiring only a minimum amount of grinding to final dimensions.

Carmet carbides can be accurately produced to practically any shape or size your designs may require, and can be supplied preformed as desired. Typical highly successful applications include inserts for drawing, heading, extruding and blanking dies; gauge and wear parts; pins; bushings; etc.

Find out, TODAY, how you can cut costs with preformed Carmet. Write or call *Allegheny Ludlum Steel Corporation, Carmet Division, Wanda and Jarvis Avenues, Detroit 20, Mich.*

Write for Your Copy:
CARMET CATALOG

Just out . . . 32 well-illustrated pages, containing data on all Carmet grades, and on Carmet blanks, tools, die sections, punches, draw die inserts, etc.; also special preforming to order.
● *Write for your copy.*

ADDRESS DEPT. M-62

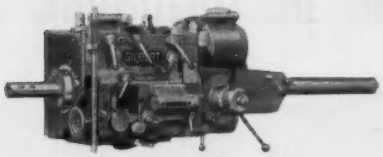
For complete MODERN Tooling, call
Allegheny Ludlum

W&D 8380

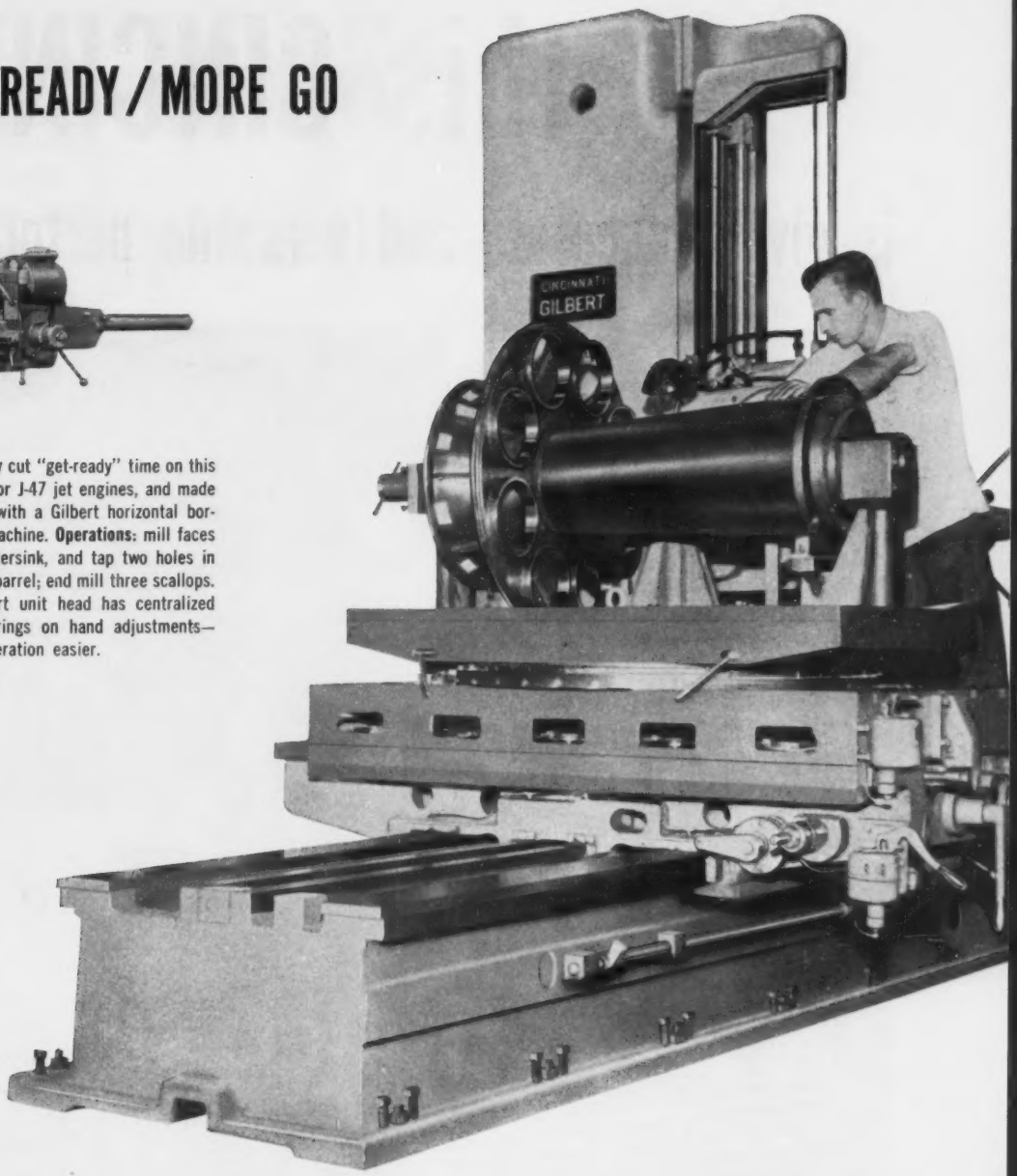
AL® FINE TOOL STEELS SINCE 1854

For more information on products advertised, use Inquiry Card, page 241

LESS GET-READY / MORE GO



Ryan Aeronautical Company cut "get-ready" time on this stainless steel aft frame for J-47 jet engines, and made "go" time produce more with a Gilbert horizontal boring, drilling, and milling machine. **Operations:** mill faces of lifting pad; drill, countersink, and tap two holes in pad; drill hole in aft frame barrel; end mill three scallops. **Time:** 105 minutes. Gilbert unit head has centralized controls, anti-friction bearings on hand adjustments—makes indexing faster, operation easier.



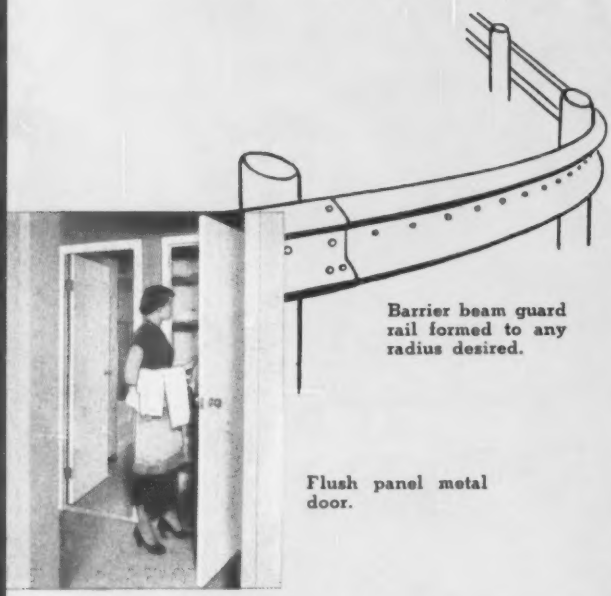
"Those who buy Gilbert buy Gilbert again" because of the efficiency of the single spindle and unit head design, ample capacity for most boring requirements, plenty of power for fast and heavy cuts with carbide tools, sustained accuracy in long, hard service. 3½-inch spindle, table and floor type boring mills available in a wide variety of arrangements. Write for Bulletin 953.

GILBERT

THE CINCINNATI GILBERT MACHINE TOOL COMPANY • 3366 BEEKMAN STREET, CINCINNATI 23, OHIO

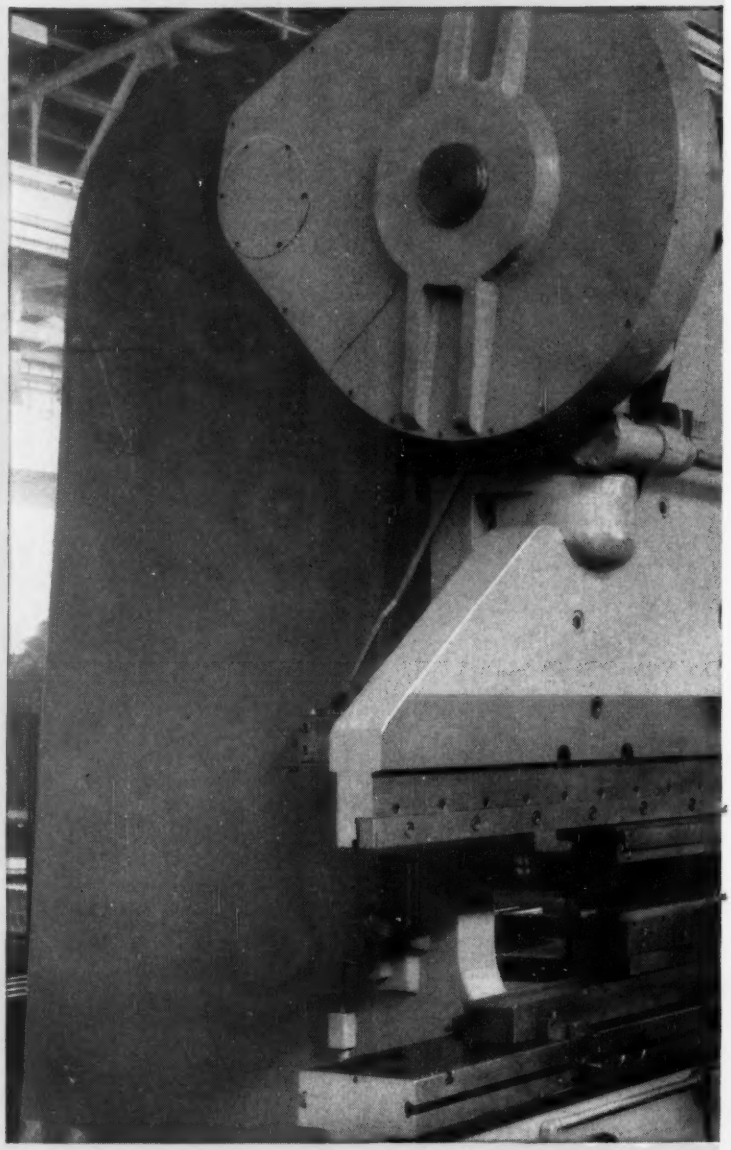
this CINCINNATI

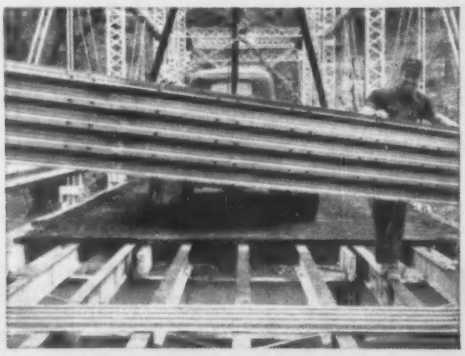
is giving accurate and versatile performance at



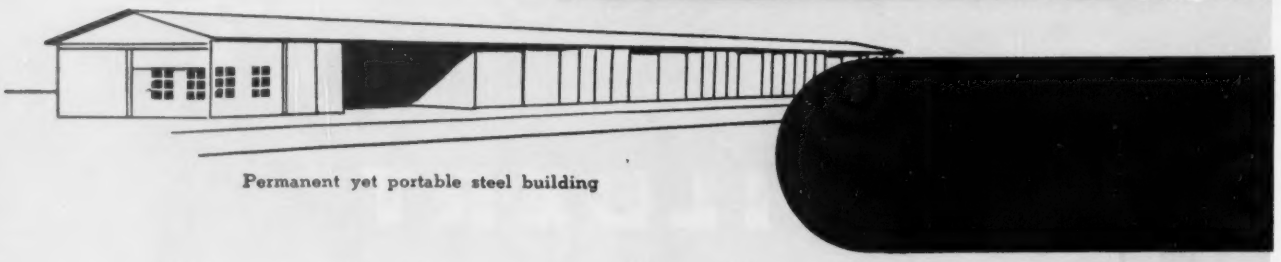
Barrier beam guard rail formed to any radius desired.

Flush panel metal door.





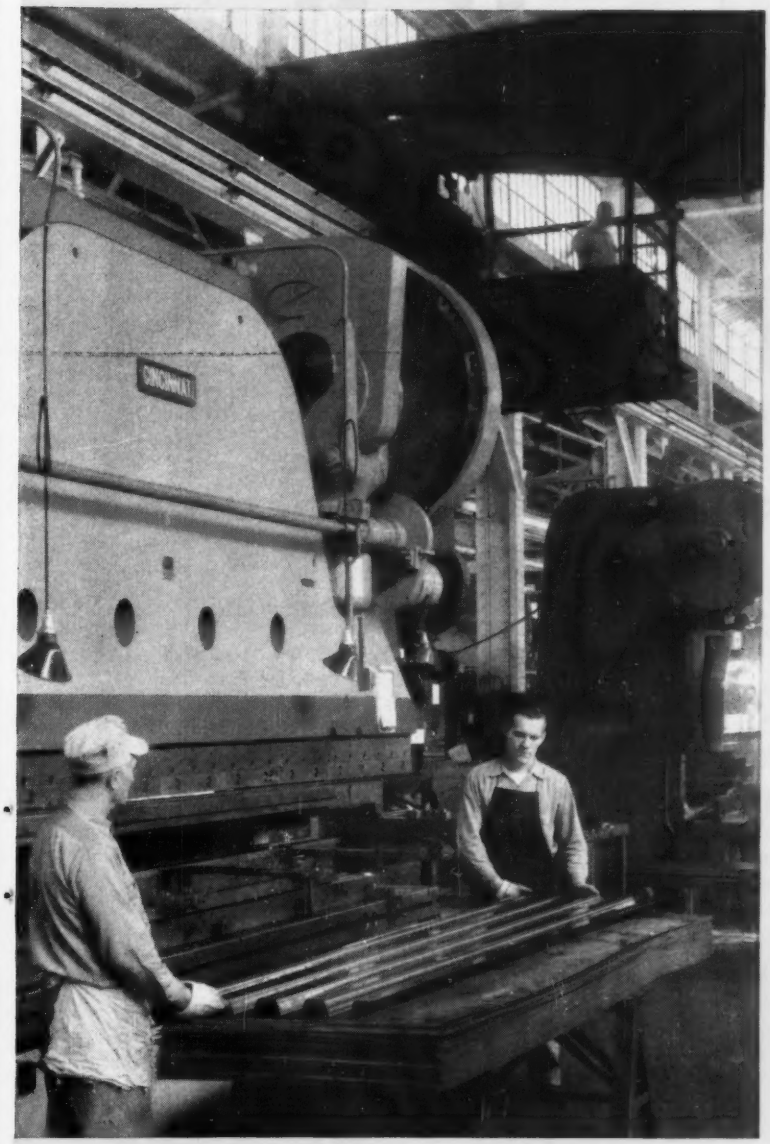
Formed structural bridge flooring



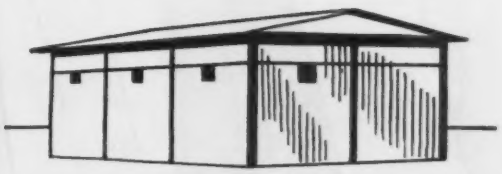
Permanent yet portable steel building

PRESS BRAKE

UNITED STEEL FABRICATORS, Inc.



Photos courtesy of United Steel Fabricators, Inc., Wooster, Ohio



All steel buildings of a thousand uses

WITH ample capacity, this powerful 500 Series Cincinnati Press Brake with 18′ 6″ clearance between housings and 22′ die area—handles formed structural bridge flooring, guard rails, steel doors. Girders and side walls for various types of metal buildings are also produced. United Steel Fabricators, Inc. are pleased with the accuracy in forming and ease and speed of operation which are important factors in this economical production.

INVESTIGATE:

—Cincinnati Center Line Loading

—Cincinnati Interlocked Construction

—Cincinnati Rigid Deep Beds and Rams

Write for the latest Press Brake Catalog B-4.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

CINCINNATI

IT'S RESULTS THAT COUNT!

STANDARD

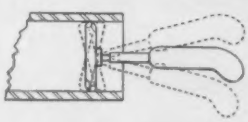
DuBo*

Plug Gages

Produce Superior Results

COLOR FLASH HANDLES
"GO" — GREEN
'NO GO" — Red

THE VALUE of a gage is "what it tells", "how well" and "how easily". If the job at hand calls for fixed limit gages, DuBo Plug Gages will give you the best value in dimensional control. DuBo tells MORE, MORE EASILY.



Operates by Tilting Handle

Whether handle will drop freely or not is the definite yes-or-no indication. No guesswork, no forcing, no fumbling!

MORE DEFINITE CHECK There is no uncertainty with DuBo as with the cylindrical type gage, whether the hole is smaller than the plug, or larger and merely close. DuBo not only checks dimensional accuracy but also reveals taper and out-of-roundness. DuBo reduces the number of parts needlessly rejected or improperly passed.

EASIER OPERATION The DuBo Plug Gage weighs from 70 to 80% less than cylindrical plug gages of the same dimension. It is self-piloting, no trouble at all to enter. A "feather touch" is all that is needed for operation. See diagram at left.

Double end DuBo Plug Gages Under 1.510"

Single end DuBo Plug Gages Over 1.510"

LONGER LIFE Gaging surfaces of the DuBo contact the bore walls only at the instant of making the check. DuBo gives you effective, economical gaging.

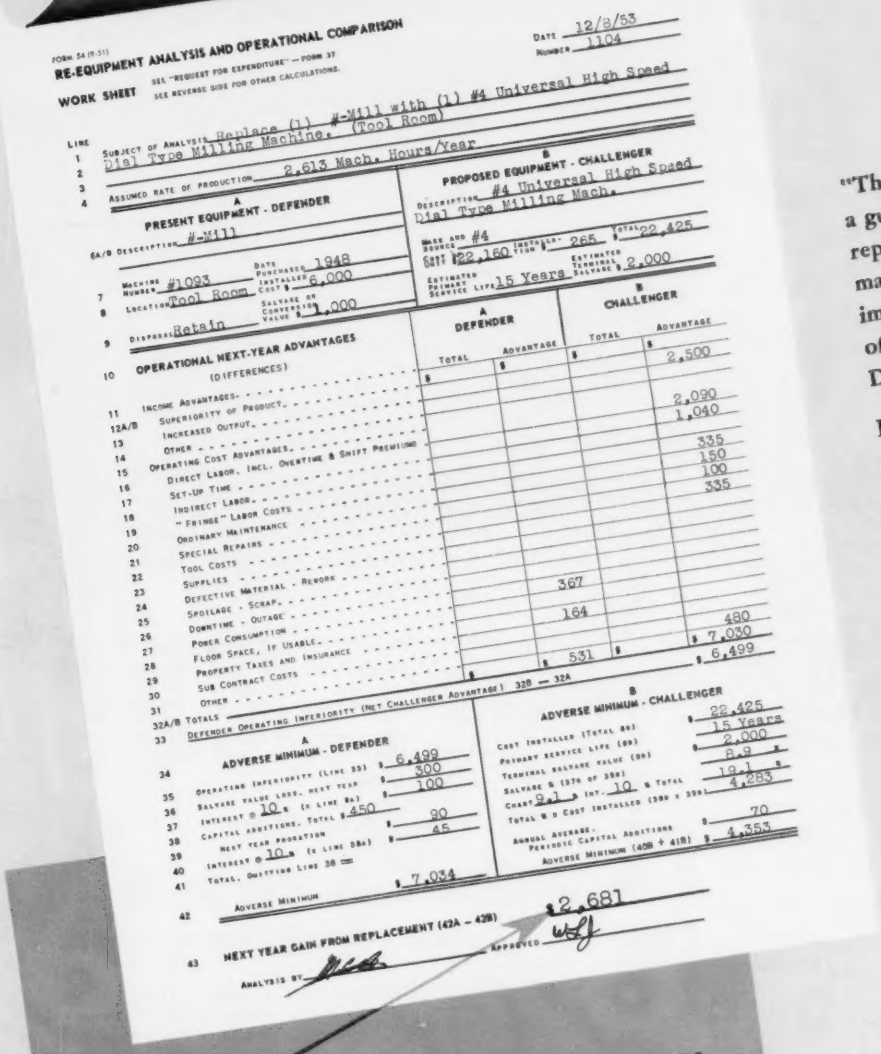
Write for Complete Information

* U.S. and Foreign Patents Granted

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

For more information on products advertised, use Inquiry Card, page 241

How Shakeproof reduces to careful analysis their cost saving opportunities



FORM 54 (9-51)

RE-EQUIPMENT ANALYSIS AND OPERATIONAL COMPARISON

WORK SHEET SEE "REQUEST FOR EXPENDITURE" — FORM 37 SEE REVERSE SIDE FOR OTHER CALCULATIONS.

DATE 12/8/53
NUMBER 1104

LINE
1 SUBJECT OF ANALYSIS Replace (1) #-Mill with (1) #4 Universal High Speed
2 Dial Type Milling Machine. (Tool Room)
3
4 ASSUMED RATE OF PRODUCTION 2,613 Mach. Hours/Year

	A PRESENT EQUIPMENT - DEFENDER	B PROPOSED EQUIPMENT - CHALLENGER
6A/B DESCRIPTION	#-Mill	#4 Universal High Speed Dial Type Milling Mach.
7 MACHINE NUMBER	#1093	MFR. AND SOURCE #4
7 DATE PURCHASED	1948	EQUIP. PRICE $22,160 INSTALLATION $ 265 TOTAL $ 22,425
8 LOCATION	Tool Room	ESTIMATED PRIMARY SERVICE LIFE 15 Years ESTIMATED TERMINAL SALVAGE $ 2,000
8 INSTALLED COST $	6,000	
9 DISPOSAL	Retain	
SALVAGE OR CONVERSION VALUE $	1,000	

10 OPERATIONAL NEXT-YEAR ADVANTAGES (DIFFERENCES)	A DEFENDER TOTAL $	A DEFENDER ADVANTAGE $	B CHALLENGER TOTAL $	B CHALLENGER ADVANTAGE $
11 INCOME ADVANTAGES-				2,500
12A/B SUPERIORITY OF PRODUCT				2,090
13 INCREASED OUTPUT				1,040
14 OTHER				
15 OPERATING COST ADVANTAGES-				335
16 DIRECT LABOR, INCL. OVERTIME & SHIFT PREMIUMS				150
17 SET-UP TIME				100
18 INDIRECT LABOR				335
19 "FRINGE" LABOR COSTS				
20 ORDINARY MAINTENANCE				
21 SPECIAL REPAIRS				
22 TOOL COSTS				
23 SUPPLIES				
24 DEFECTIVE MATERIAL - REWORK				
25 SPOILAGE - SCRAP		367		
26 DOWNTIME - OUTAGE				
27 POWER CONSUMPTION		164		
28 FLOOR SPACE, IF USABLE				480
29 PROPERTY TAXES AND INSURANCE				
30 SUB CONTRACT COSTS				
31 OTHER				
32A/B TOTALS	$	$ 531	$	$ 7,030
33 DEFENDER OPERATING INFERIORITY (NET CHALLENGER ADVANTAGE) 328 — 324				$ 6,499

34	A ADVERSE MINIMUM - DEFENDER		B ADVERSE MINIMUM - CHALLENGER	
35	OPERATING INFERIORITY (LINE 33)	$ 6,499	COST INSTALLED (TOTAL 8G)	$ 22,425
36	SALVAGE VALUE LOSS, NEXT YEAR	$ 300	PRIMARY SERVICE LIFE (8D)	15 Years
37	INTEREST @ 10 % (% LINE 8A)	$ 100	TERMINAL SALVAGE VALUE (8H)	$ 2,000
38	CAPITAL ADDITIONS, TOTAL $ 450		SALVAGE % (37% OF 38H)	8.9 %
39	NEXT YEAR PRORATION	$ 90	CHART 2.1 % INT. 10 % TOTAL	19.1 % 4,283
40	INTEREST @ 10 % (% LINE 38A)	$ 45	TOTAL % & COST INSTALLED (38G + 38H)	
41	TOTAL. QUOTING LINE 38 =		ANNUAL AVERAGE PERIODIC CAPITAL ADDITIONS	$ 70
			ADVERSE MINIMUM (40B + 41B)	$ 4,353
42	ADVERSE MINIMUM	$ 7,034		
43	NEXT YEAR GAIN FROM REPLACEMENT (42A – 42B)	$ 2,681		

ANALYSIS BY [signature] APPROVED WSJ

*** GAIN FROM REPLACEMENT UNDER THE MAPI METHOD IS . . .**

. . . AFTER RETURN ON THE NEW INVESTMENT

. . . AFTER ALLOWANCE FOR FUTURE OBSOLESCENCE OF NEW EQUIPMENT

"The MAPI plan serves as a guide to equipment replacement and manufacturing technique improvements in all plants of the Shakeproof Division."

EUGENE W. FULLER
Vice President and Division Mgr.
SHAKEPROOF DIVISION
ILLINOIS TOOL WORKS

Keep gathering metal-working production ideas . . . be well informed when the time for replacement arrives . . .

ROCKFORD
INSERT
GROUP

February, 1955

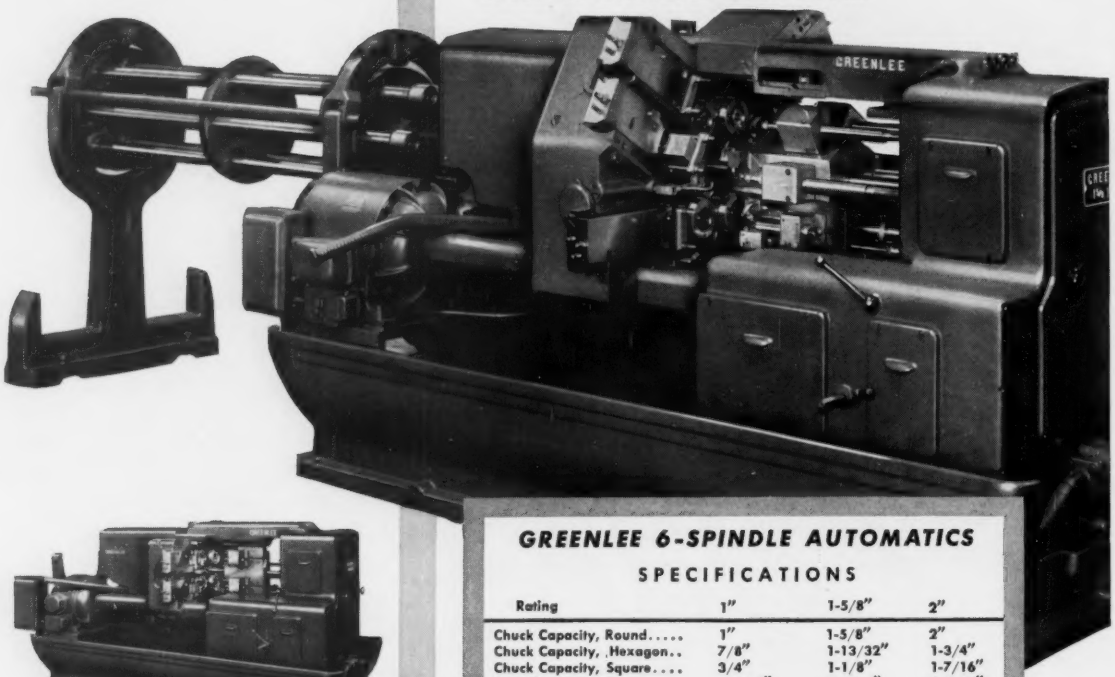
PRODUCTION MACHINERY

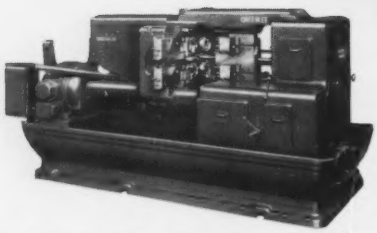
GREENLEE

AUTOMATIC BAR MACHINES

INCREASE YOUR PRODUCTION... LOWER YOUR COSTS!

CUT YOUR SET-UP TIME
SPEED-UP DIFFICULT OPERATIONS





GREENLEE 6-SPINDLE AUTOMATICS

SPECIFICATIONS

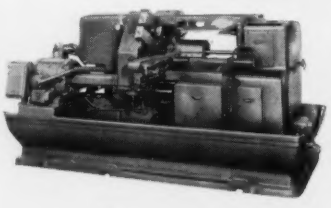
Rating	1"	1-5/8"	2"
Chuck Capacity, Round	1"	1-5/8"	2"
Chuck Capacity, Hexagon	7/8"	1-13/32"	1-3/4"
Chuck Capacity, Square	3/4"	1-1/8"	1-7/16"
Stock Feed	6-3/16"	8-5/16"	8-5/16"
Turning Length	6"	7-1/2"	7-1/2"
Spindle Speed Range	225 to 2500	105 to 2175	95 to 1935
Feed Range per Spindle Rev.	.0014 to .0218	.0017 to .0388	.0019 to .043
Motor Horsepower	15	20	25
R. P. M.	1800	1800	1800
Floor space:			
Length with Stock Reel	17'-6"	17'-3"	17'-3"
Width	5'-0"	5'-4"	5'-4"
Height	4'-11"	5'-4"	5'-4"
Net Weight in Pounds	14,400	17,940	18,150

GREENLEE 4-SPINDLE AUTOMATIC

SPECIFICATIONS

Rating	2-5/8"
Chuck Capacity, Round	2-5/8"
Chuck Capacity, Hexagon	2-1/4"
Chuck Capacity, Square	1-7/8"
Stock Feed	8-3/16"
Turning Length	7-1/2"
Spindle Speed Range	120 to 1200
Feed Range per Spindle Rev.	.002 to .0458
Motor Horse Power	20
R. P. M. of Motor	1800
Floor Space:	
Length with Stock Reel	17'-3"
Width	5'-4"
Height	5'-0"
Net Weight in Pounds	17,000

GREENLEE 2ND OPERATION AUTOMATIC



Extremely versatile, high-production machines. Parts can be loaded semi-automatically or fully automatically. Incorporates the same basic features . . . inherent production and operating advantages as the standard 6-Spindle Automatics.

INVESTIGATE NOW
PHONE
ROCKFORD, ILLINOIS
3-4881

PRODUCTION MACHINERY

GREENLEE

GREENLEE BROS. & CO.
1862 MASON AVENUE
ROCKFORD, ILLINOIS

MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**

AUTOMATED BROACHING
BALANCED PRODUCTION

with two machines

ANOTHER

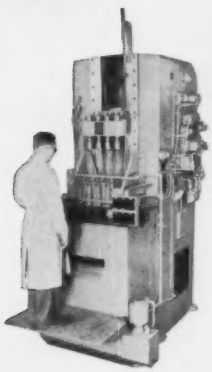
American

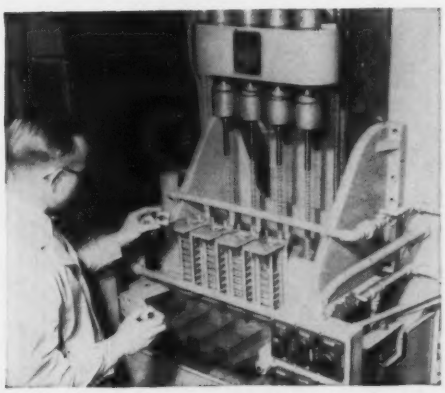
FIRST

This "working team" of two American Broaching Machines produces 3,000 rocker arm brackets per hour.

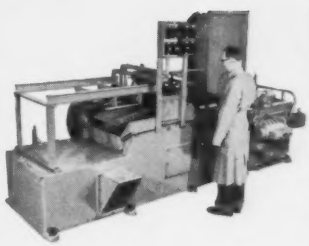
An American (VP) vertical hydraulic internal pull-up broaching machine, arranged for 4-station operation, broaches the ¾" diam. hole in the part. The part is then conveyed to a hydraulic broaching machine, which straddle broaches the sides of the parts. The feeds, broaching strokes and ejectors of the two machines are completely automated to provide continuous, balanced production.

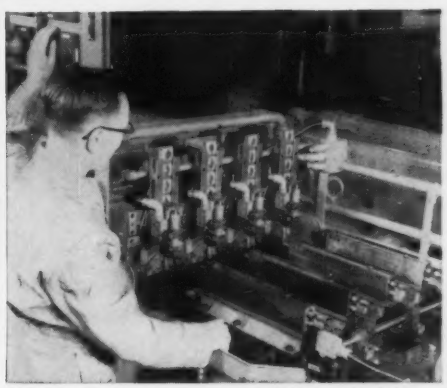
American machines, broaches and fixtures are made in sizes and types to fit your exact requirements. Why not let American engineers solve your broaching problems. Send a part print or sample. Ask for Catalog No. 450.



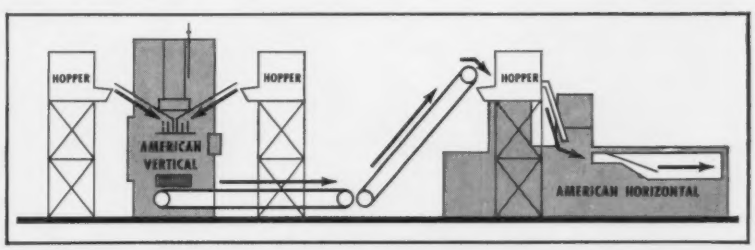


At the vertical machine, the die-cast aluminum parts are fed from hoppers into magazine feeds, the hole is broached and the parts automatically ejected onto a conveyor. Cycle is continuous.





Expanding arbors of the horizontal machine pick up the parts from magazine feeds and push them past stationary broaches which straddle broach the sides. Parts are ejected automatically on the return stroke.



AMERICAN *American* BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

American Building - Ann Arbor, Michigan

SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

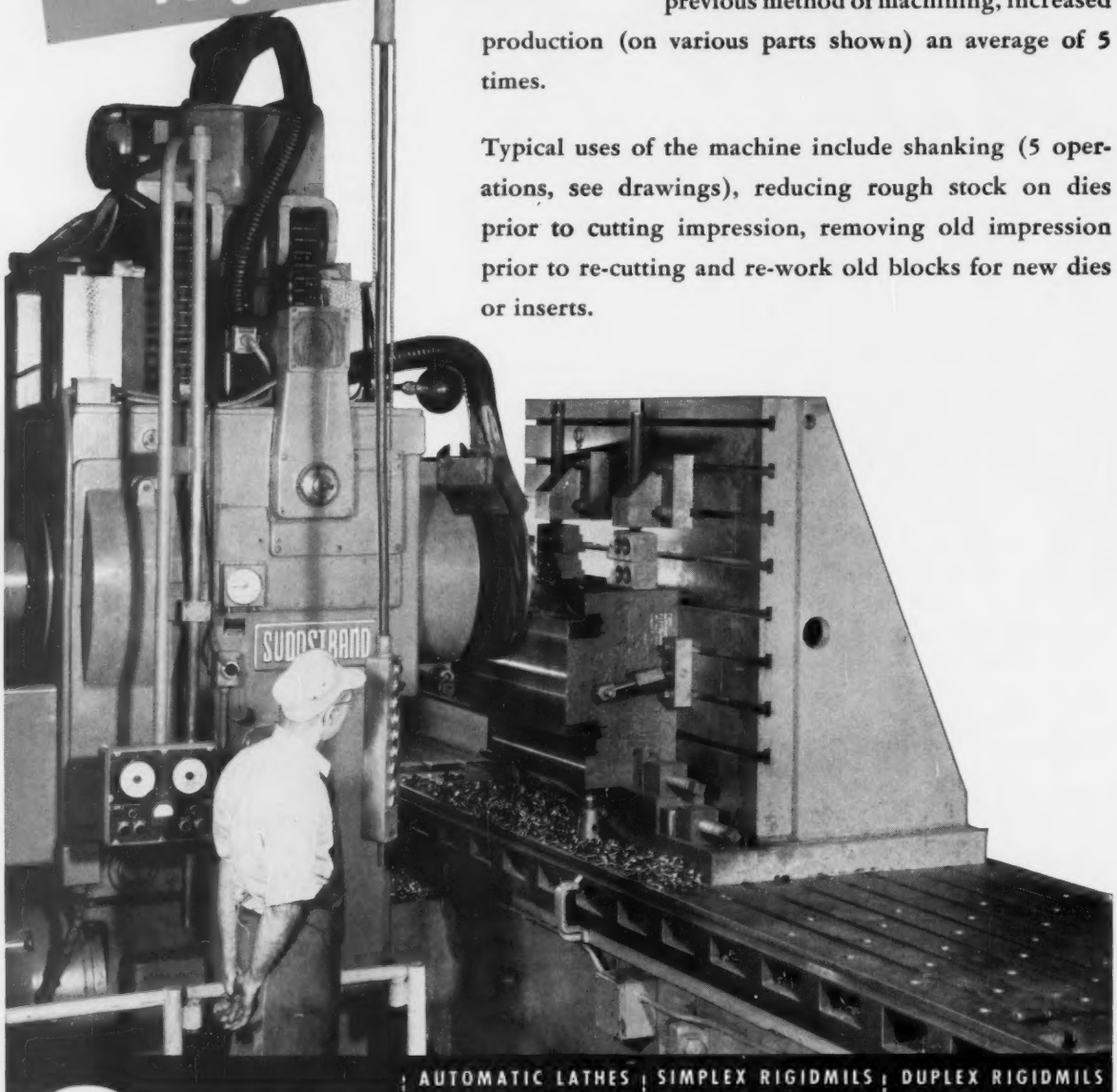
FOR PRODUCTION MACHINE TOOLS IT'S ROCKFORD, ILLINOIS, U.S.A.

Here's THE Machine For Miscellaneous Die Block Milling In Forge Shops

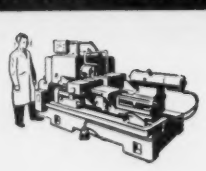
Milling Increases Production 5 Times

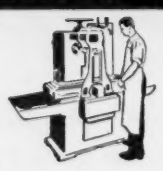
Here's a machine designed for heavy work such as milling die blocks from rough, removing impression before re-cutting on used die blocks, and similar heavy jobs. Milling, as compared to the previous method of machining, increased production (on various parts shown) an average of 5 times.

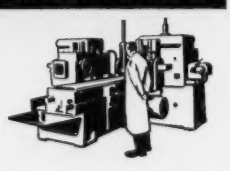
Typical uses of the machine include shanking (5 operations, see drawings), reducing rough stock on dies prior to cutting impression, removing old impression prior to re-cutting and re-work old blocks for new dies or inserts.



AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS







SUNDSTRAND "Engineered Production" Service*

*REG. U.S. PAT. OFF.

CENTER OF MACHINE-TOOL EXCELLENCE **ROCKFORD, ILLINOIS, U.S.A.**

Typical parts machined on the Sundstrand Model 77 Rigidmil.

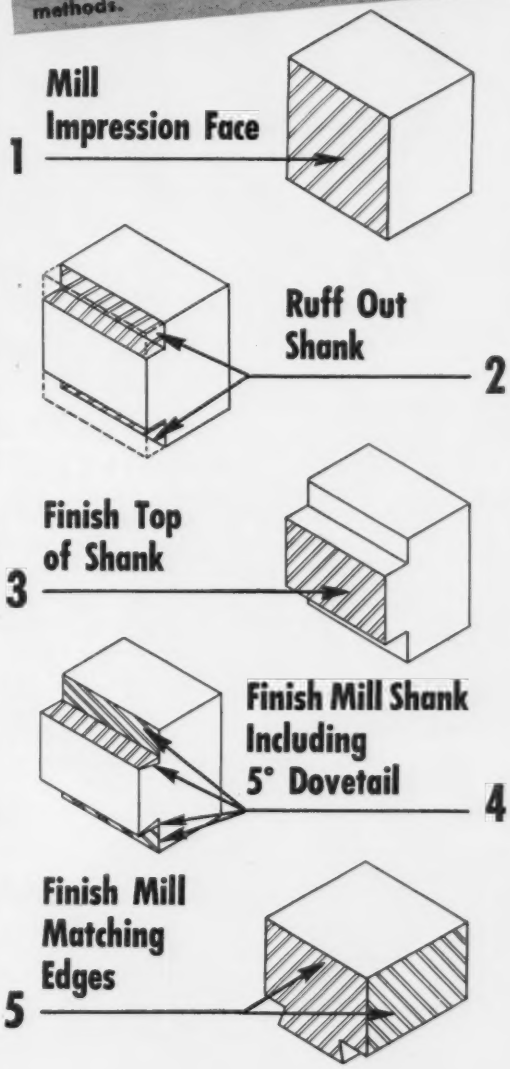
The Sundstrand Model 77 Rigidmil is a heavy-duty machine capable of taking heavy cuts with carbide cutters. It has vertical feed to head in combination with longitudinal table feed so that an automatic square cycle can be obtained for rough milling of die shanks. Machine can be operated automatically or manually. The spindle head is of the horizontal type and is available up to 100 horsepower. Although the machine illustrated is a Model 77 Rigidmil, both larger and smaller Sundstrand machines are available for similar heavy duty milling. If you have work of this nature, investigate Sundstrand "Engineered Production" Service. There is no obligation.

Additional Data

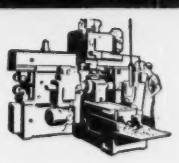
Additional information is available in this folder. Write for your copy today. Ask for bulletin 652.

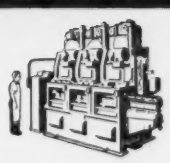
TYPICAL OPERATIONS

Below are shown the sequence of operations for shanking of die blocks. The die blocks shown are 16" x 16" x 12" and the time for milling a matching set was less than 4½ hours. Larger sizes can be machined with a proportionate saving in time over conventional methods.



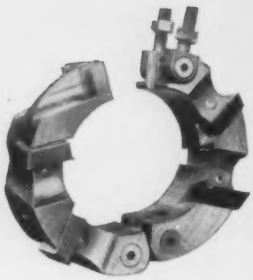
TRIPLEX RIGIDMILS | SPECIAL MACHINES

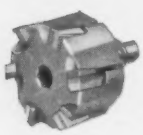




SUNDSTRAND
Machine Tool Co.
2530 Eleventh St. • Rockford, Ill., U.S.A.

FOR PRODUCTION MACHINE TOOLS IT'S **ROCKFORD, ILLINOIS, U.S.A.**



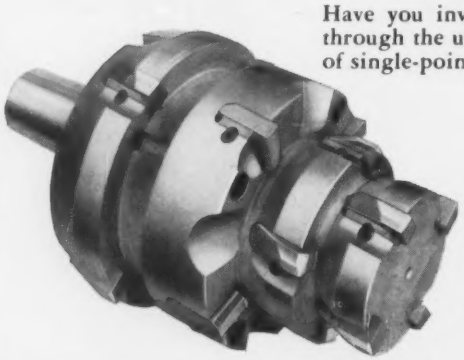


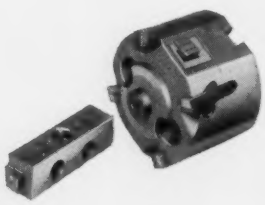
INGERSOLL BORING TOOLS SPEED DIESEL CRANKCASE PRODUCTION

These unusual Ingersoll inserted blade boring heads are used on a specially designed Ingersoll machine built for a manufacturer of diesel locomotives.

The range of our experience in machining holes is further illustrated by tools which Ingersoll has developed for high-production work on automobile cylinder blocks and for small-lot production on all types of general-purpose bar-type machines.

Have you investigated opportunities for savings in your work through the use of multiple-point Ingersoll boring tools in place of single-point tools?





WRITE FOR Catalog 60B, describing Ingersoll Inserted Blade face mills, end mills, helical slab mills, side mills, arbor cutters, angular cutters, and boring heads.

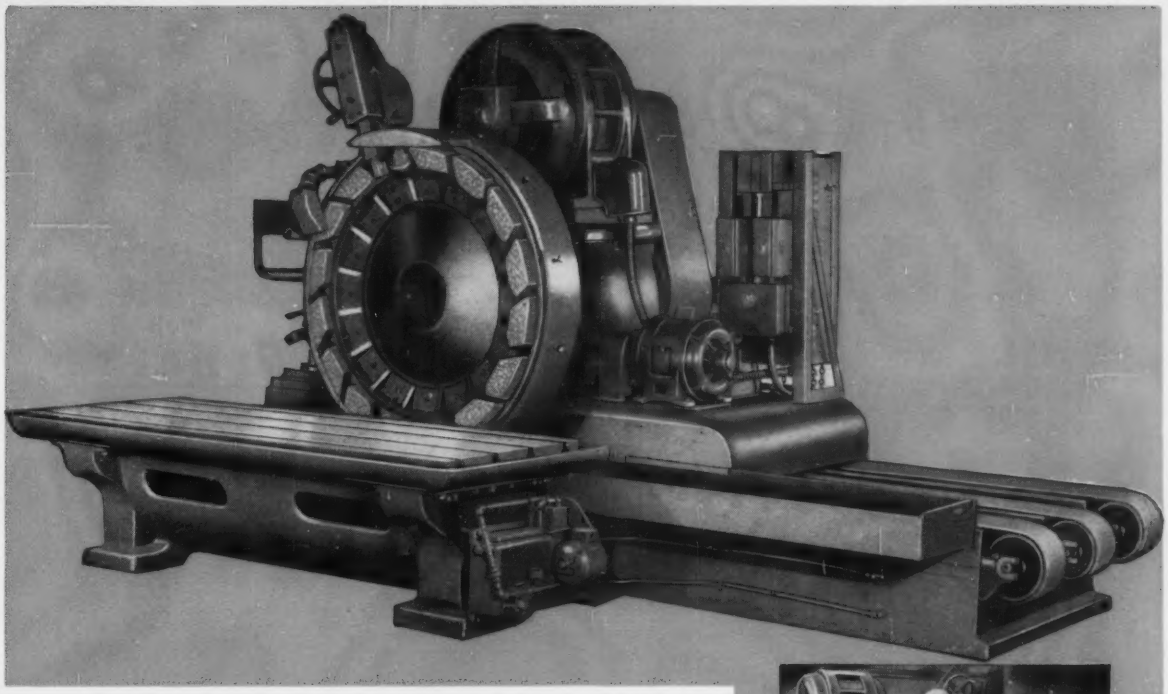
THE INGERSOLL MILLING MACHINE COMPANY

ROCKFORD, ILLINOIS, U. S. A.

BUILDERS OF SPECIAL DESIGN MILLING & BORING MACHINES

ORIGINATORS OF SHEAR CLEAR CUTTERS

MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**

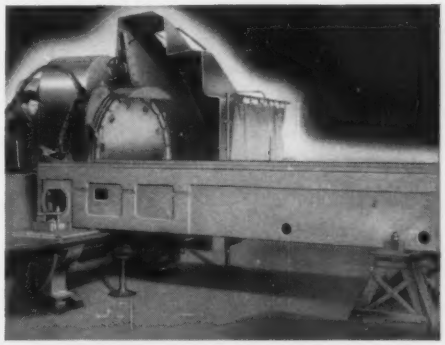


MATTISON TRAVELING WHEEL GRINDER FOR FAST FINISHING OF LONG OR LARGE PARTS

If your work consists of long or bulky parts, Mattison UK Traveling Wheel Grinders will finish them at a surprising rate of speed and accuracy and at very low cost. Large and awkward shaped pieces are frequently ground in a good deal less time than previous method. The part, no matter how large, is clamped in a stationary position and the grinding wheel passes across the surface to be finished. Amount of floor space needed is little more than half that required by traveling table machines of equal capacity. The operator's position on the carriage, together with the convenient grouping of all controls, makes for utmost grinding accuracy and speed regardless of the size of the job.

For further information, send for new free circular No. 844-2 RM covering this machine.

The operator rides the carriage of the UK Traveling Wheel Grinder. From this position he gets a safe unobstructed view of the grinding wheel at point of contact and can observe the work at all times.



Heavy work of practically any length can be rapidly ground to close tolerances with no more power required than for lighter work — the UK's table is always stationary. Picture shows end of 35′ base being ground.

MATTISON MACHINE WORKS
ROCKFORD · ILLINOIS

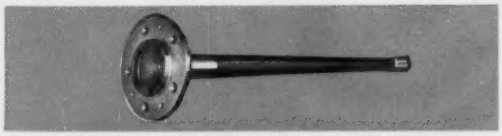
FOR PRODUCTION MACHINE TOOLS IT'S **ROCKFORD, ILLINOIS, U.S.A.**

REHNBERG-JACOBSON

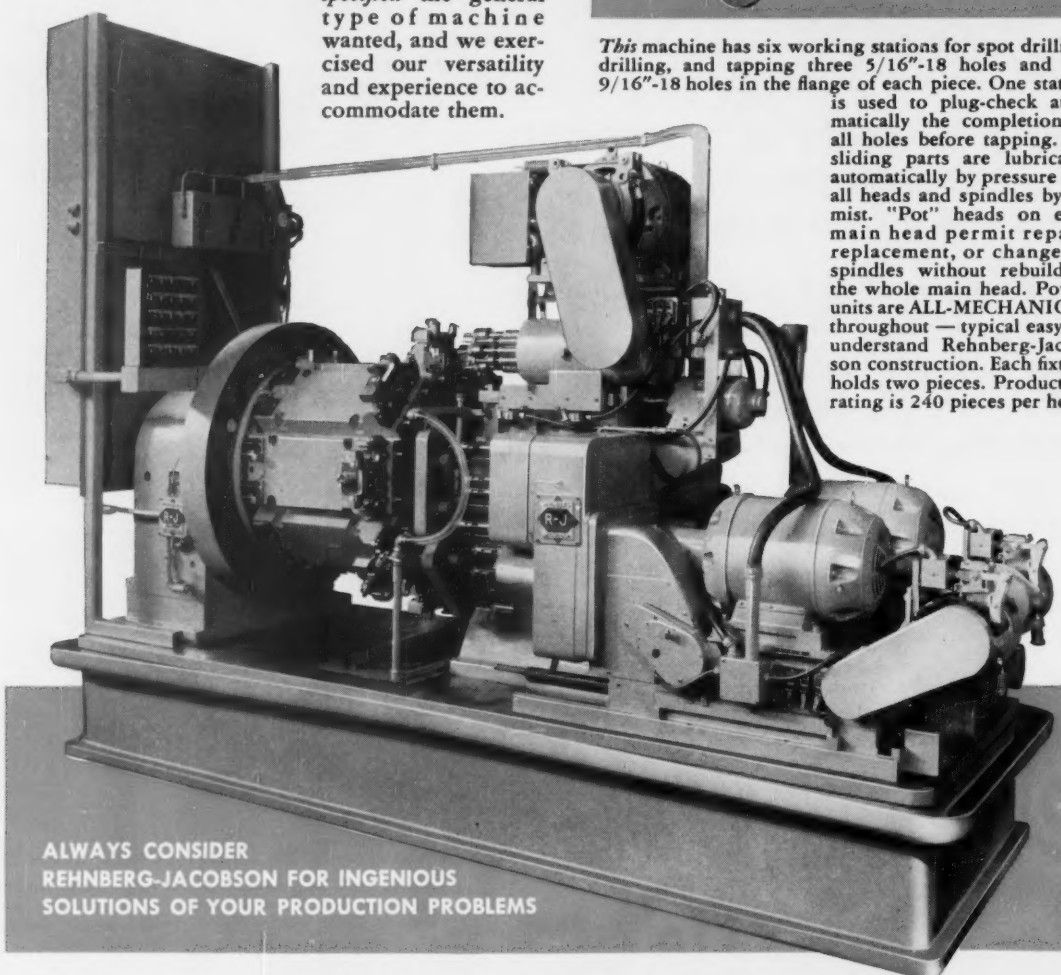
Shows the way to...

DRILL and TAP MORE REAR AXLE SHAFTS ...THIS TIME ON A HORIZONTAL MACHINE

A couple of months ago we ran an advertisement showing a *vertical* machine for Rear Axle Shafts. Here, for another auto maker, is a *horizontal* machine for similar work. In each case the *purchaser specified* the general type of machine wanted, and we exercised our versatility and experience to accommodate them.



This machine has six working stations for spot drilling, drilling, and tapping three 5/16"-18 holes and five 9/16"-18 holes in the flange of each piece. One station is used to plug-check automatically the completion of all holes before tapping. All sliding parts are lubricated automatically by pressure and all heads and spindles by oil mist. "Pot" heads on each main head permit repair, replacement, or change of spindles without rebuilding the whole main head. Power units are ALL-MECHANICAL throughout — typical easy-to-understand Rehnberg-Jacobson construction. Each fixture holds two pieces. Production rating is 240 pieces per hour.



ALWAYS CONSIDER
REHNBERG-JACOBSON FOR INGENIOUS
SOLUTIONS OF YOUR PRODUCTION PROBLEMS

Designers and Builders of Special Machinery

REHNBERG-JACOBSON MANUFACTURING COMPANY

2135 KISHWAUKEE ST.

ROCKFORD, ILLINOIS

MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**

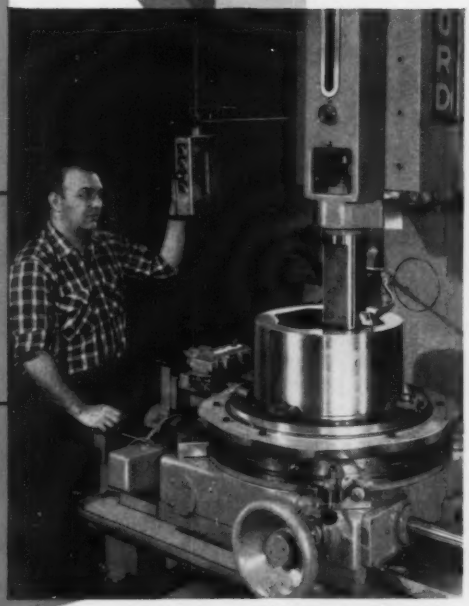
ROCKFORD *Hy-Draulic* SLOTTERS

equipped with

Kopy-Kat

duplicators

Cutting cam from tool-room-made master.



Cutting new mold from functional cam.

Cut Dies Fast, Accurately, Economically

This manufacturer wished to duplicate blanking dies fast, accurately and inexpensively. A standard Hydraulic Slotter, equipped with a Kopy-Kat Duplicator, was used and this is how the job was done:

The tool-room-made master is placed on the Slotter. From it, the duplicator develops the functional cam. This cam is an enlarged projection of the die, in reverse, and is followed by the duplicator stylus in producing the finished dies. Sketches show the sequence of operations as performed.

Kopy-Kat equipped Hydraulic Slotters are readily adaptable to an almost endless variety of internal and external contour machining problems. A Rockford Machine Tool Co. representative can give you further details of the special advantages of the versatile Kopy-Kat Duplicator and how it may simplify your form machining work.

Hy-Draulic
Reg. U. S. Pat. Off.

ROCKFORD MACHINE TOOL CO.
2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS

CITY OF MACHINE-TOOL SPECIALISTS **ROCKFORD, ILLINOIS, U.S.A.**

BARBER COLMAN

Announcing

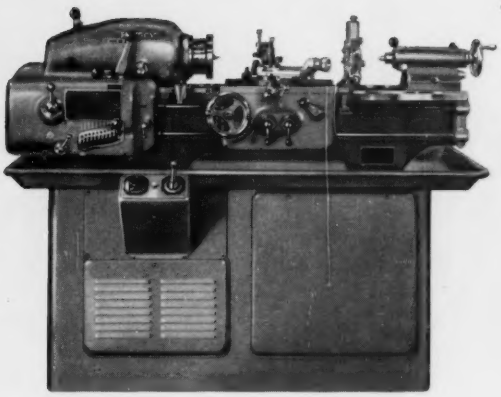
the Hendey machine division of BARBER-COLMAN COMPANY

The manufacturing rights for the products of the Hendey Machine Company have been acquired by Barber-Colman Company. Hendey toolroom and production lathes and Hendey shapers will be manufactured by the Hendey Machine Division of Barber-Colman Company at Rockford, Illinois.

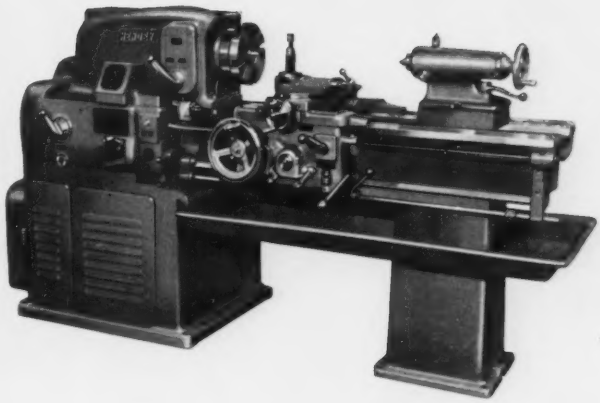
Barber-Colman will manufacture these lathes and shapers with all the special skills and techniques which have made its gear hobbing machines and hob sharpening machines of such outstanding quality. Users of Hendey machines will be afforded the same excellent service which Barber-Colman has always extended to its customers.

For further information about Hendey lathes and shapers, call your nearest Hendey representative or write to the Hendey Machine Division, Barber-Colman Company, Rockford, Illinois.

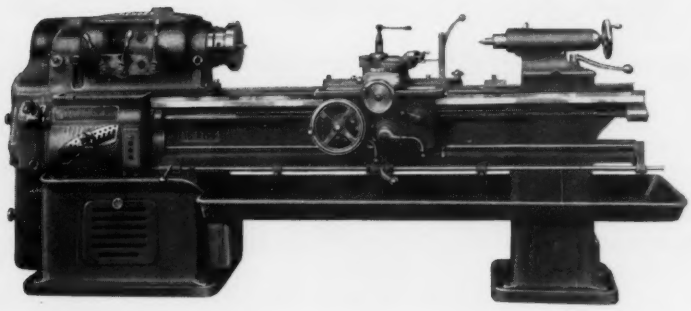
CENTER OF MACHINE-TOOL EXCELLENCE **ROCKFORD, ILLINOIS, U.S.A.**



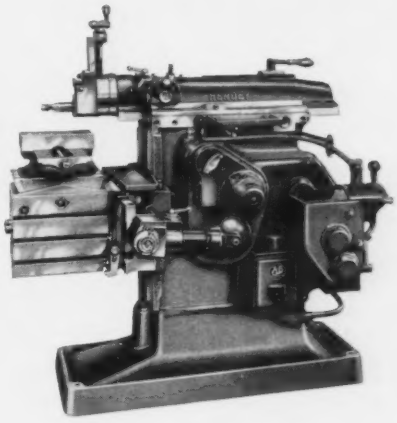
9" Tool and Gagemakers' Lathe



No. 2E General Purpose 14" Lathe



12", 14" and 16" — 18 speed Geared Head Lathe



12" High-Speed Shaper

Hendey machine division

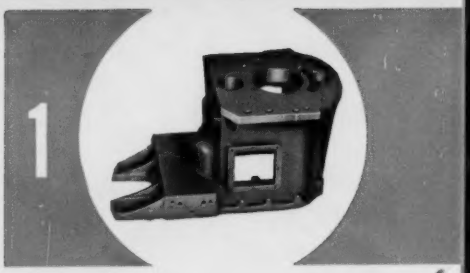
BARBER COLMAN

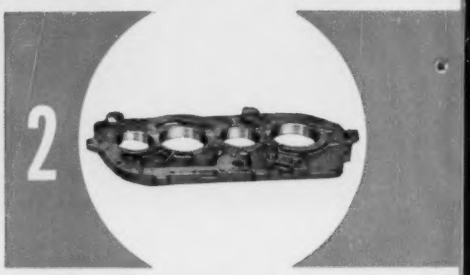
BARBER-COLMAN COMPANY

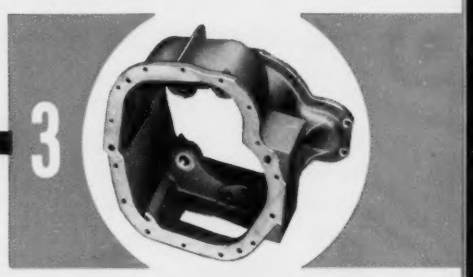
211 LOOMIS ST., ROCKFORD, ILL.

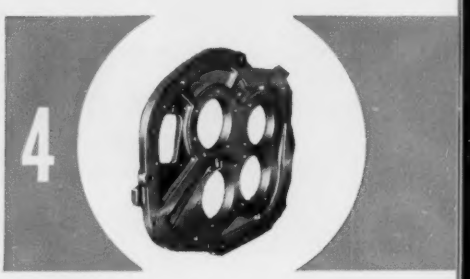
CITY OF MACHINE-TOOL SPECIALISTS **ROCKFORD, ILLINOIS, U.S.A.**

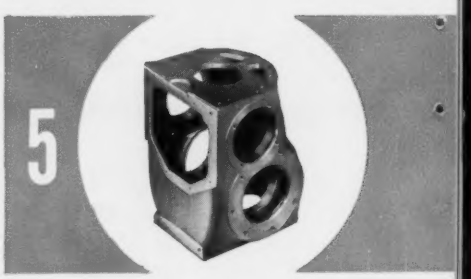
5 DIFFERENT WORKPIECES PROCESSED ON ONE W. F. & JOHN BARNES SPECIAL MACHINE











Versatile Tooling and Special Machine Precision Lower Costs, Improve Quality of Motor Grader Transmissions

This W. F. & John Barnes unit, designed and built for the J. D. Adams Manufacturing Co., Indianapolis, Ind., combines all the built-in advantages of a special machine . . . yet it machines not one, but FIVE separate and dissimilar workpieces that together form a complete transmission housing. Ingenious planning of spindle arrangement, tooling, and fixtures enables only 31 spindles to perform a total of 53 operations on the five workpieces. Special fixtures and numbered gauges locate the work and tooling quickly and accurately . . . complete change-over from one housing section to another averages only six hours.

Engineering and building a distinctive machine like this just doesn't happen by accident . . . it's the result of over 75 years of accumulated knowledge in a highly specialized field. That's why at Barnes you'll find the creative skills, plus complete and adequate facilities, for designing and building better machines to lower your production costs . . . improve product quality.

ASK FOR AN ANALYSIS OF YOUR PRODUCTION METHODS

Find out how Barnes' unique creative and specialized resources can help you cut costs. Your problem will be given expert and individual attention.

W. F. & JOHN BARNES

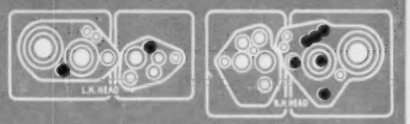
BUILDERS OF BETTER MACHINES SINCE 1879

MULTIPLE SPINDLE DRILLING • BORING • TAPPING

CENTER OF MACHINE-TOOL EXCELLENCE **ROCKFORD, ILLINOIS, U.S.A.**

LOWER TRANSMISSION CASE

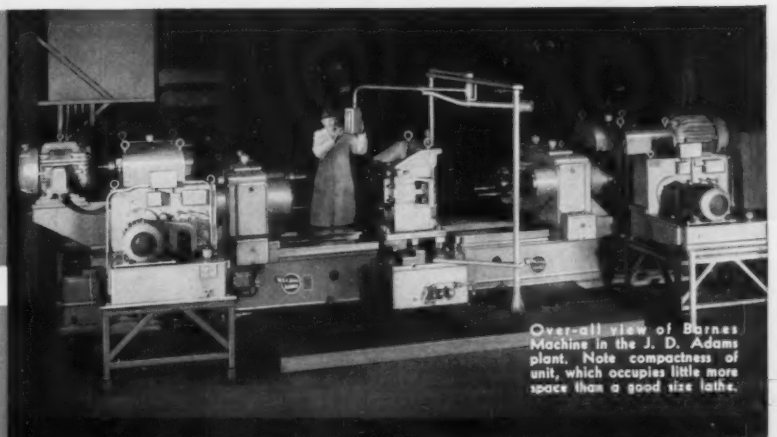
2 Operations — 6 Operations



Drawings illustrate the spindle arrangement in the opposed heads and how they are individually tooled to perform chamfering, rough, semi-finish and finish boring, and facing operations in the five different workpieces. Two auxiliary heads mounted at right angles to the machine bore dowel holes in the Final Drive Housing.

INTERMEDIATE PLATE

5 Operations — 10 Operations



Over-all view of Barnes Machine in the J. D. Adams plant. Note compactness of unit, which occupies little more space than a good size lathe.

UPPER TRANSMISSION CASE

5 Operations — 10 Operations

Closeup of fixture used for Upper Transmission Case. Note rings for quick removal. Spindle housings are divided and gear boxes separated from housings to minimize heat rise.

UPPER TRANSMISSION CASE COVER

Idle — 6 Operations

FINAL DRIVE HOUSING

2 Operations — 2 Operations

AUXILIARY HEADS COMPLETE 2 OPERATIONS AT RIGHT ANGLE TO REGULAR MACHINE SPINDLES

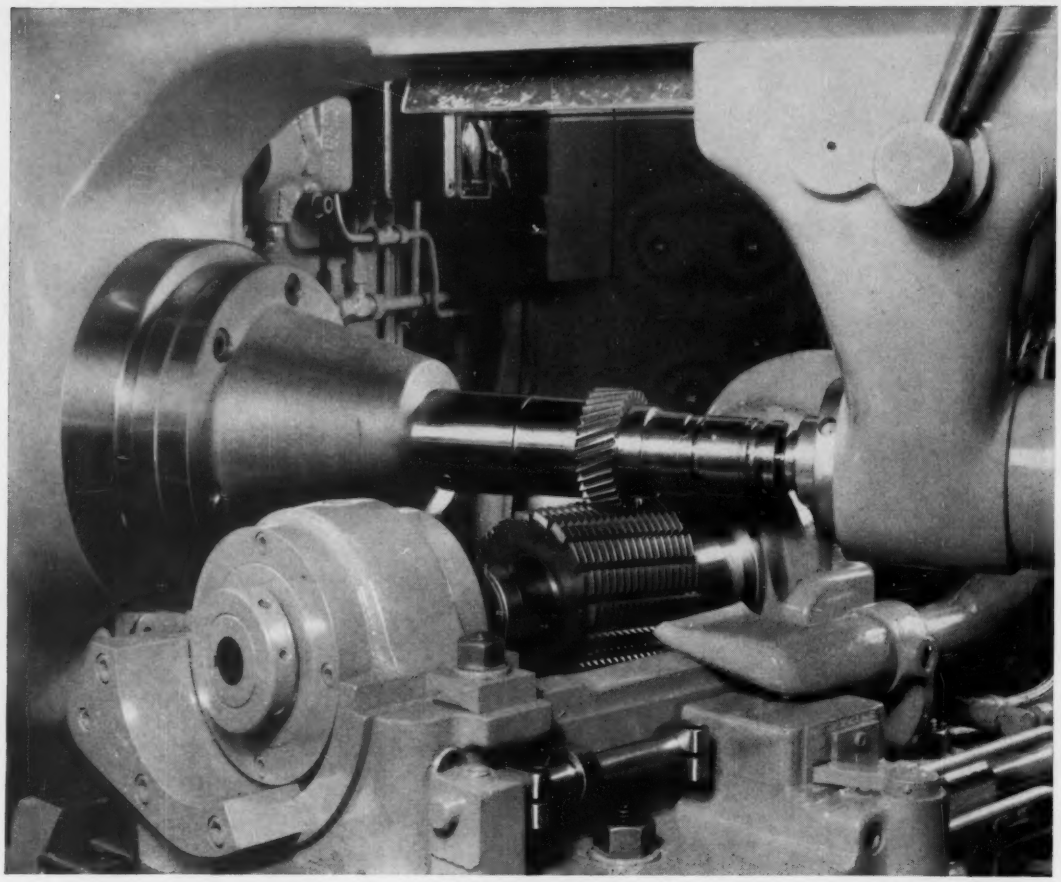
INVESTIGATE BARNES' 6-POINT MACHINE TOOL BUILDING SERVICE . . .

A Coordinated Creative Engineering and Manufacturing Service designed to help you solve problems quickly and efficiently. Write today for your free copy of "*Coordinated Machine Engineering*".

W. F. & JOHN BARNES COMPANY • 402 SOUTH WATER ST., ROCKFORD, ILLINOIS

MACHINES • AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES

FOR PRODUCTION MACHINE TOOLS IT'S ROCKFORD, ILLINOIS, U.S.A.



HIGH-SPEED HOBBING

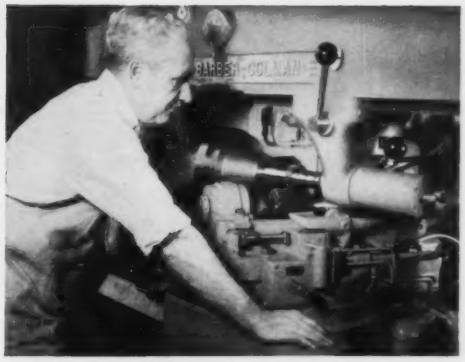
INCREASES PRODUCTION AND TOOL LIFE

The Barber-Colman No. 14-15 Hydraulic Hobbing Machine is being used in several plants for hobbing of steel gears at speeds of approximately 300 SFM with an increase in both production and tool life. Although these speeds have not been considered practical until recently, the size, power and rigidity of the No. 14-15 Machine make it ideal for high-speed hobbing. Even with a standard hob slide, speeds of 300 SFM with a 5″ hob are possible. However, most machines for high-speed hobbing are equipped with a special heavy-duty, high-speed hob swivel.

The high-speed hob swivel is capable of speeds up to 950 RPM and is designed to accommodate hobs up to 7″ diameter. The extra size and weight of this swivel provide the rigidity to maintain accuracy at high speeds. It is equipped with super-precision ball or tapered roller bearings. An automatic hob shifter may be furnished as extra equipment. High-speed hob swivels may be installed on recent machines in the field.

BUILDERS OF PRECISION GEAR

CENTER OF MACHINE-TOOL EXCELLENCE **ROCKFORD, ILLINOIS, U.S.A.**



The jobs shown here indicate at least 200% increase in production, 100% better tool life, greater profile accuracy and equal or improved surface finish on the hobbed gears, hobbing at speeds of 300 SFM or greater. Using ground and unground hobs, gears were cut from a wide range of steels as high as 207 Br. hardness.

FIRST SERIES OF TESTS

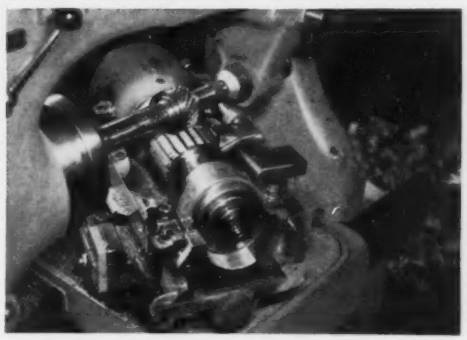
GEAR		STANDARD HOB SWIVEL		HIGH-SPEED HOB SWIVEL		% INCREASE	
DP	No. Teeth	Cutting Time at 135 SFM	Pieces Per Shift	Cutting Time at 326 SFM	Pieces Per Shift	Prod.	Tool Life
6	36 Spur	10.64 min.	72	4.2 min.	161	253%	223%
6	35 Spur	11.62 min.	72	4.5 min.	151	258%	209%
8	55 Helical	15.14 min.	50	6.94 min.	105	218%	210%
8	62 Helical	26.8 min.	28	10.3 min.	72	260%	257%

Double Thread Hob, 5x5x2
Steel — AISI 8620 normalized
Feed — .060"/rev.
No difference in surface quality
Profile and lead angle above average accuracy

SECOND SERIES OF TESTS

HOB	GEAR	SPEED	FEED
Accurate Unground 9 D.P. 3-Thd. 5x5x2	22 Teeth, Helical SAE 5135 170-207 BHN	307 SFM	.045"/rev.
Same	Same	307 SFM	.070"/rev.

Climb Hobbing
Material — AISI 5135
Average lead error—at .070" feed within .0006" in 13/16"
Total Composite Error—.002" both feeds
Estimated Hob Life—200 per sharpening
Using same speed and feeds with conventional hobbing, resulting finish was not as good.



Although high-speed hobbing of steel gears is not used extensively as yet, it is used on enough jobs to prove that it is applicable under the proper conditions. Tests indicate that tool life increases until a speed of 200 SFM is reached, and then drops off rapidly to a speed of 250 SFM. After 250 SFM, however, hob life increases again until it is equivalent or better at 300 SFM than at 200 SFM. Materials on which satisfactory results have been produced include AISI 1113, 8620, 5135 and 4140.

Our Engineers have been working with our customers on high-speed hobbing and have helped to solve many problems. They will be glad to discuss the economy of high-speed hobbing to your specific job if you will submit your part print and production requirements to them.

Call your Barber-Colman representative or write direct to:

HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

BARBER COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT, 623 ROCK STREET, ROCKFORD, ILLINOIS

HOBS AND MACHINES SINCE 1911

CITY OF MACHINE-TOOL SPECIALISTS **ROCKFORD, ILLINOIS, U.S.A.**

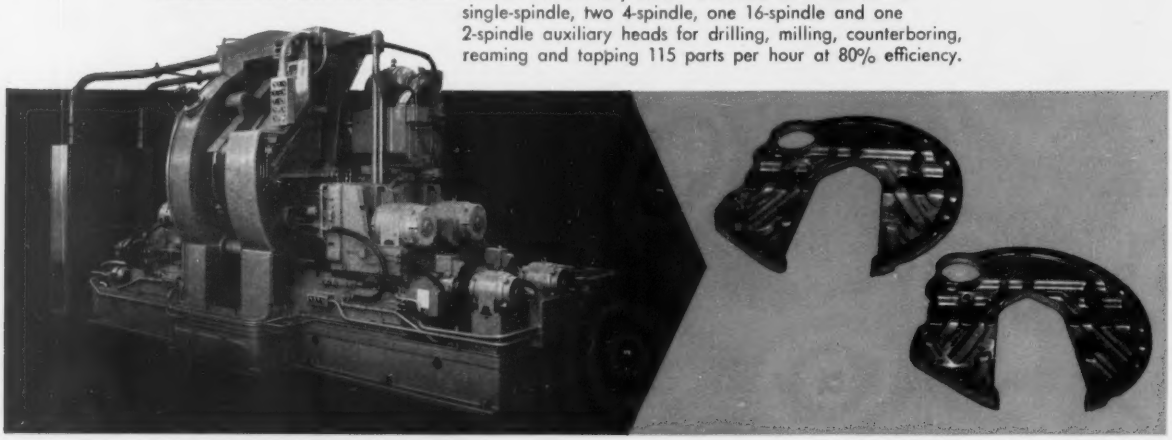
BARNESDRIL

UNIT MACHINES

GUARANTEE

CONTROLLED PRODUCTION-RATE

BARNESDRIL SPECIAL UNIT-MACHINE with 6-station rotary index. Machine is tooled with 2 single-spindle, two 4-spindle, one 16-spindle and one 2-spindle auxiliary heads for drilling, milling, counterboring, reaming and tapping 115 parts per hour at 80% efficiency.



BARNESDRIL SPECIAL DOUBLE-END TRUNNION MACHINE for drilling, chamfering and tapping holes in aluminum housing adaptor plate at the rate of 70 parts per hour, 80% efficiency. Tooling includes two 16-spindle, one 11-spindle and one 10-spindle auxiliary head, and one 6-spindle and one 13-spindle lead screw tapping units.

send for complete catalog, bulletin 1505

These are Typical Examples —
of BarnesdriL Engineering Skill in combining a specified number of production operations into a single automatic cycle, to produce a required rate of production.
A wide range of work operations is available through the flexibility of rotary index, lateral index, drum index or work transfer mechanisms. Units adapt themselves to vertical, horizontal or angular arrangement. Call your BarnesdriL representative for recommendations on your production-rate problems.

HOLE BARNESDRIL FINISHING

BARNES DRILL CO.

820 CHESTNUT STREET • ROCKFORD, ILLINOIS

MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**

HOW MANY OPERATIONS WHEN YOU PREPARE STEEL FOR PAINTING?

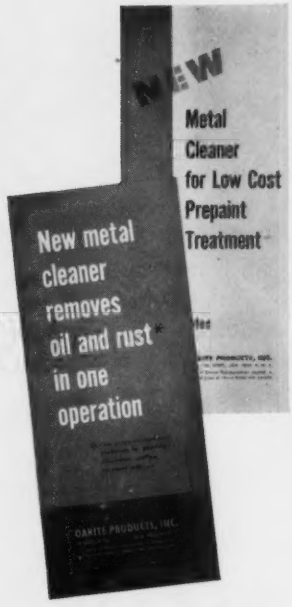
	Operations
Cleaning	1
Rinsing	1
Pickling	1
Rinsing	1
Conditioning	1
Rinsing	1
Drying	1
Total	3

What's wrong with that addition? How can seven operations add up to three operations?

It's easy when you use Oakite Compound No. 33 (or Oakite Compound No. 31) to remove rust or heat scale *at the same time that* it removes oil *at the same time that* it prepares steel (or aluminum) for the lasting adhesion of paint.

That combines cleaning, pickling and paint conditioning into one operation. After rinsing and drying, you have saved the time, the tanks, the space and the solutions for four operations.

O. C. No. 33 is great for removing heavy soil in tanks or for cleaning by hand. O. C. No. 31 is very economical for removing moderate soil in tanks. Each compound is able to strip certain types of paint.



FREE For booklets describing the specific advantages and applications of Oakite Compounds Nos. 31 and 33, just mail the coupon.

OAKITE PRODUCTS, INC., 26 Rector St., New York 6, N. Y.

Send me your FREE booklets on Oakite Compounds Nos. 31 and 33. I am especially interested in removing the following soils from ☐ steel, ☐ cast iron, ☐ sheet aluminum, ☐ aluminum castings:

☐ Oil and grease
☐ Drawing compounds
☐ Rust preventives
☐ Identification inks
☐ Carbon smut
☐ Paint
☐ Rust
☐ Heat scale
☐ Tarnish
☐ Welding flux
☐ Soldering flux
☐ .....

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Company _____

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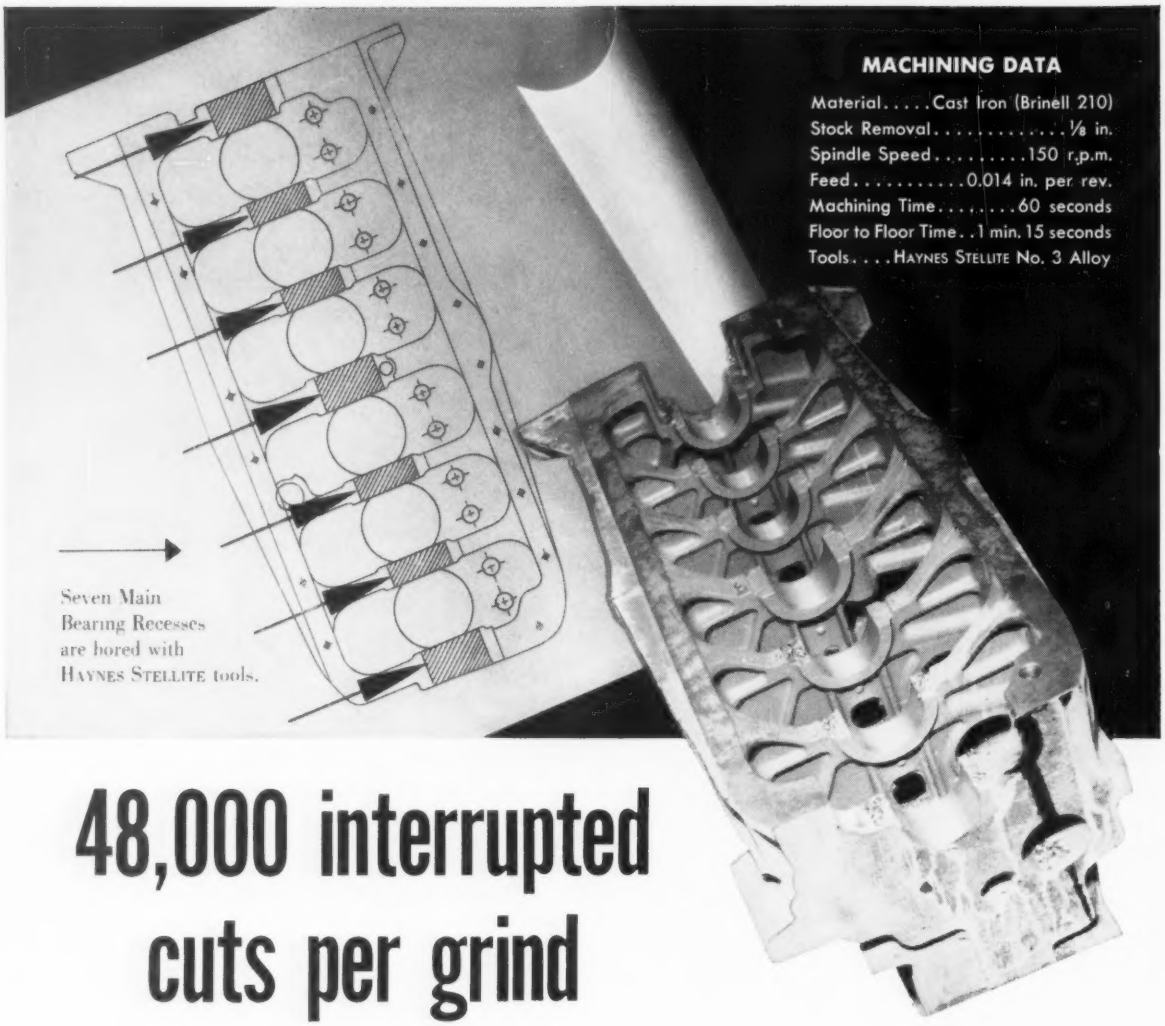
Technical Service Representatives in Principal Cities of U.S. & Canada

SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS • METHODS • SERVICE


MACHINING DATA
Material.....Cast Iron (Brinell 210)
Stock Removal.....⅛ in.
Spindle Speed.....150 r.p.m.
Feed.....0.014 in. per rev.
Machining Time.....60 seconds
Floor to Floor Time..1 min. 15 seconds
Tools....Haynes Stellite No. 3 Alloy
Seven Main Bearing Recesses are bored with Haynes Stellite tools.

48,000 interrupted cuts per grind

Haynes Stellite tools machine the main bearing recesses in 320 cast iron engine blocks between grinds. Each of 14 tools used in the set-up makes 150 interrupted cuts in each block . . . a total of 48,000 interrupted cuts per grind. The tools remain in operation for a full eight-hour shift, without chipping or spalling. Other tools tested on this job chipped under the constant hammering of the intermittent cuts, and had to be replaced in less than an hour.

Standard tool bits ¾ in. square and 2 in. long, made of Haynes Stellite alloy No. 3, are used for this operation. Only 0.015 in. of metal has to be removed when the tools are sharpened, and the tools can be reground about 30 times. Then, when they are too short to be used for boring the main bearings, they are used to machine the smaller cam bearing recesses. In this second operation the same tools can be reground about 50 times more!

There are four grades of Haynes Stellite metal-cutting tools varying in hardness, compressive strength, and impact resistance. For a complete description of properties, sizes, and recommended operating data, write for the free booklet, "Haynes Stellite Metal-Cutting Tools."

HAYNES TRADE-MARK ALLOYS

HAYNES STELLITE COMPANY

A Division of Union Carbide and Carbon Corporation

UCC

General Offices and Works, Kokomo, Indiana

Sales Offices

Chicago • Cleveland • Detroit • Houston • Los Angeles • New York • San Francisco • Tulsa

"Haynes" and "Haynes Stellite" are registered trade-marks of Union Carbide and Carbon Corporation

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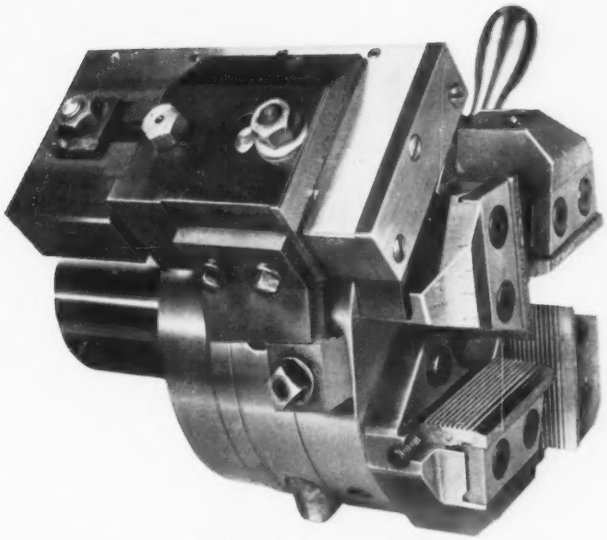
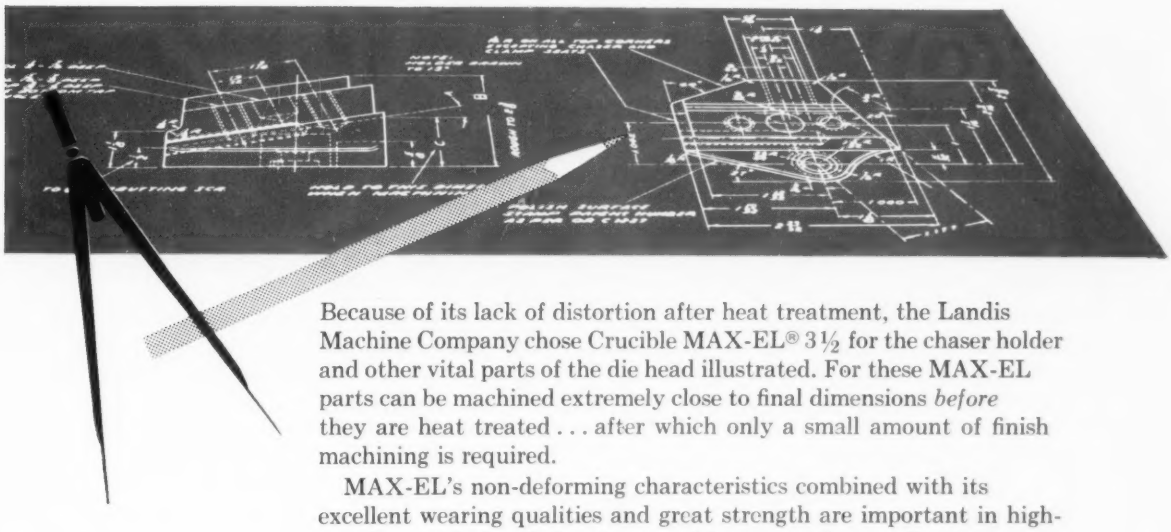


Non-deforming **MAX-EL** alloy steel parts require minimum finish machining



Because of its lack of distortion after heat treatment, the Landis Machine Company chose Crucible MAX-EL® 3½ for the chaser holder and other vital parts of the die head illustrated. For these MAX-EL parts can be machined extremely close to final dimensions *before* they are heat treated . . . after which only a small amount of finish machining is required.

MAX-EL's non-deforming characteristics combined with its excellent wearing qualities and great strength are important in high-speed turret lathe die heads . . . and in many other applications.

Your shop will benefit, too, from the ease of machining, freedom from distortion, superior quality and longer tool life you get with MAX-EL. To start taking advantage of MAX-EL *now, call Crucible.*

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking **ALLOY STEELS**

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

Branch Offices and Warehouses: ATLANTA • BALTIMORE • BOSTON • BUFFALO • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DAYTON DENVER • DETROIT • HOUSTON • INDIANAPOLIS • LOS ANGELES • MILWAUKEE • NEWARK • NEW HAVEN • NEW YORK • PHILADELPHIA • PITTSBURGH PROVIDENCE • ROCKFORD • SAN FRANCISCO • SEATTLE • SPRINGFIELD, MASS. • ST. LOUIS • ST. PAUL • SYRACUSE • TORONTO, ONT. • WASHINGTON, D. C.

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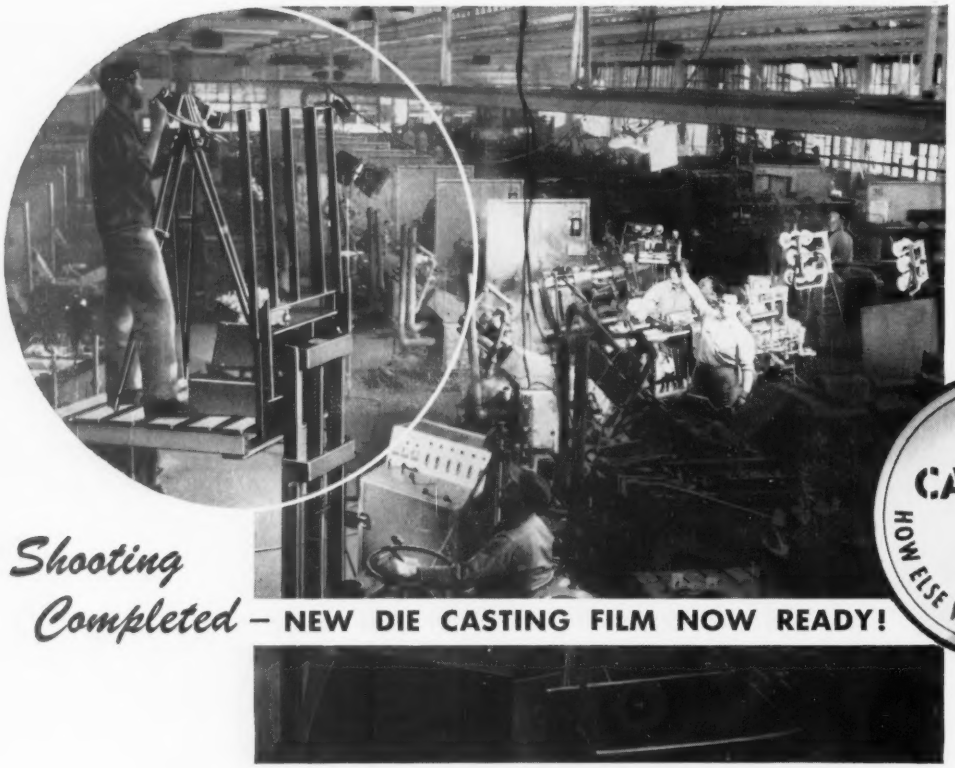

Shooting Completed – **NEW DIE CASTING FILM NOW READY!**

DIE CASTING

RUSH

HOW ELSE WOULD YOU MAKE IT?

Get the Facts on ZINC Die Casting ECONOMIES

When you see the new motion picture "DIE CASTING—How Else Would You Make It?" (just released by the American Zinc Institute, Inc.) you will learn the basic reasons why ZINC Die Castings are so low in cost. You will find, for example, that their economy begins with the kind of machine on which they are produced.

The above scene from the new film shows a battery of high speed ZINC die casting machines. *Only* ZINC, among the principal die casting metals, can be cast in these machines. And this maximum production speed means minimum die casting costs to you.

But the 35-minute motion picture is not confined to the actual casting procedure. It also covers part design, die design, secondary operations, finishing and applications. It not only will help you to bring ZINC into proper focus among die casting metals but it establishes the relationship of die casting to other high speed production methods.

HOW TO SEE THE NEW FILM—

If you have access to projection equipment (the film is 16 mm. Kodachrome with sound) and can arrange to get a group together to see the picture, a print can be borrowed free-of-charge from the American Zinc Institute, Inc., 60 East 42nd Street, New York 17, New York. When writing, try to give several alternate dates for the showing and advise the size of the audience (you will also receive copies of a new 24-page booklet on die castings for those viewing the film).

The New Jersey Zinc Company
160 Front St., New York 38, N. Y.

ZINC
FOR DIE CASTING ALLOYS

The Research was done, the Alloys were developed, and most Die Castings are based on

HORSE HEAD SPECIAL (99.99+% Uniform Quality) ZINC

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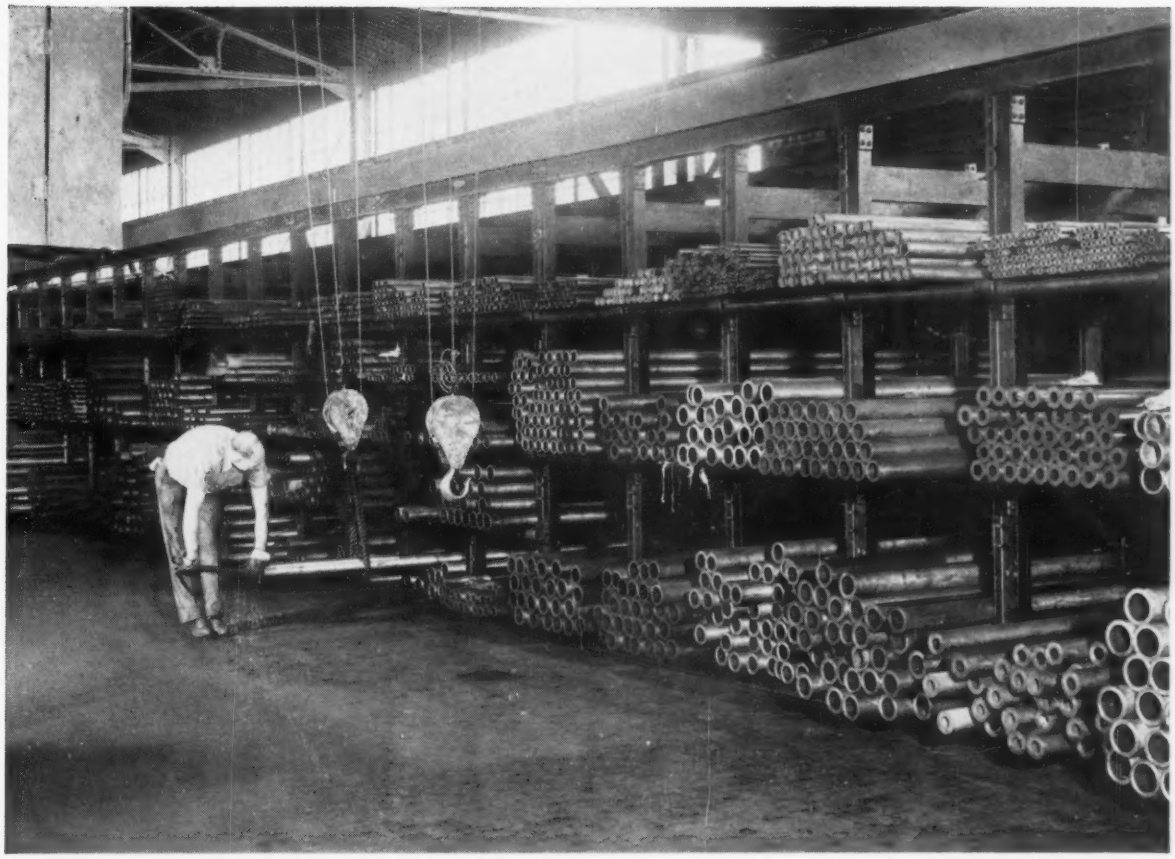


That TIMKEN® 52100 steel tubing you ordered yesterday?—we're shipping it to you today

WE'RE ready to ship your size of Timken® 52100 steel tubing in less-than-mill quantities within 24 hours. That's because 101 sizes are available in mill stock for your rush hollow parts jobs.

A high-carbon chromium steel, 52100 is ideal for most high quality hollow parts jobs. It will through-harden in moderate sections, can be heat treated to file hardness and tempered back to any point you wish. It is often used in place of more expensive steels.

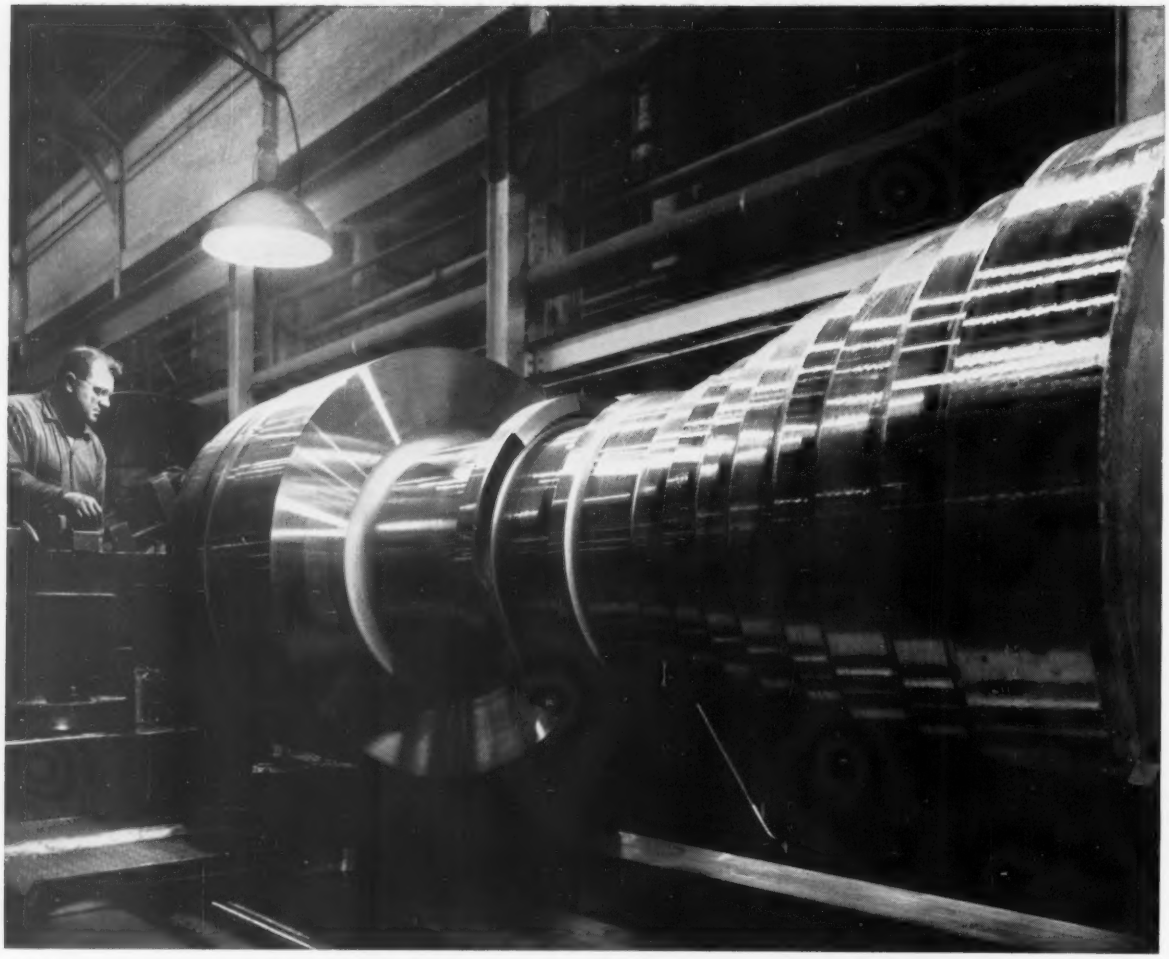
Excellent for hollow parts jobs such as aircraft parts, ball bearing races, pump parts and plungers, collets, bushings, spindles, grinding machine parts and precision instrument parts, Timken 52100 can be had in sizes from 1″ to 10½″ O.D.

America's pioneer producer of 52100 tubing, the Timken Company is the *only* company that makes 52100 steel in tubing, bars and wire. We have a background of experience that can't be equalled. In terms of benefits to you, it's an experience that assures uniform quality from tube to tube and from heat to heat.

Want immediate delivery? Write, wire or phone us now your less-than-mill quantity order. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD — THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING



21-Ton Forging Becomes Spindle for Steam Turbine

This big forging, made of chromium-molybdenum-vanadium steel, weighs approximately 43,000 lb—over 21 tons. It was upset and solid-forged from an ingot, then rough-turned, block-bit-bored, and heat-indicated for stability. At the machining stage shown here, the forging is 18 ft 8½ in. long and has various diameters ranging from 14⅛ to 52⅞ in.

It is in the process of becoming a spindle for a large steam turbine—one of many such pieces that Bethlehem has made through the years. You could call it a typical example of Bethlehem heavy forgings, though it by no means represents the top limits of our shop capacity. Some of our giant-size forgings have exceeded 100 tons with plenty to spare.

Down at the other end of the line, we make drop forgings weighing as little as one pound. And in between the two extremes you will find about every size, type, and weight of forging that is ever called for—including some unusual items that might never occur to you. Example: tapered-end forged-and-bored pieces for high-temperature, high-pressure service in central stations and oil refineries.

No matter what kind of forgings you require—large, medium, or small—Bethlehem can make them for you. Call us when you're in the market! A job done in the Bethlehem shops is one you can depend upon.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

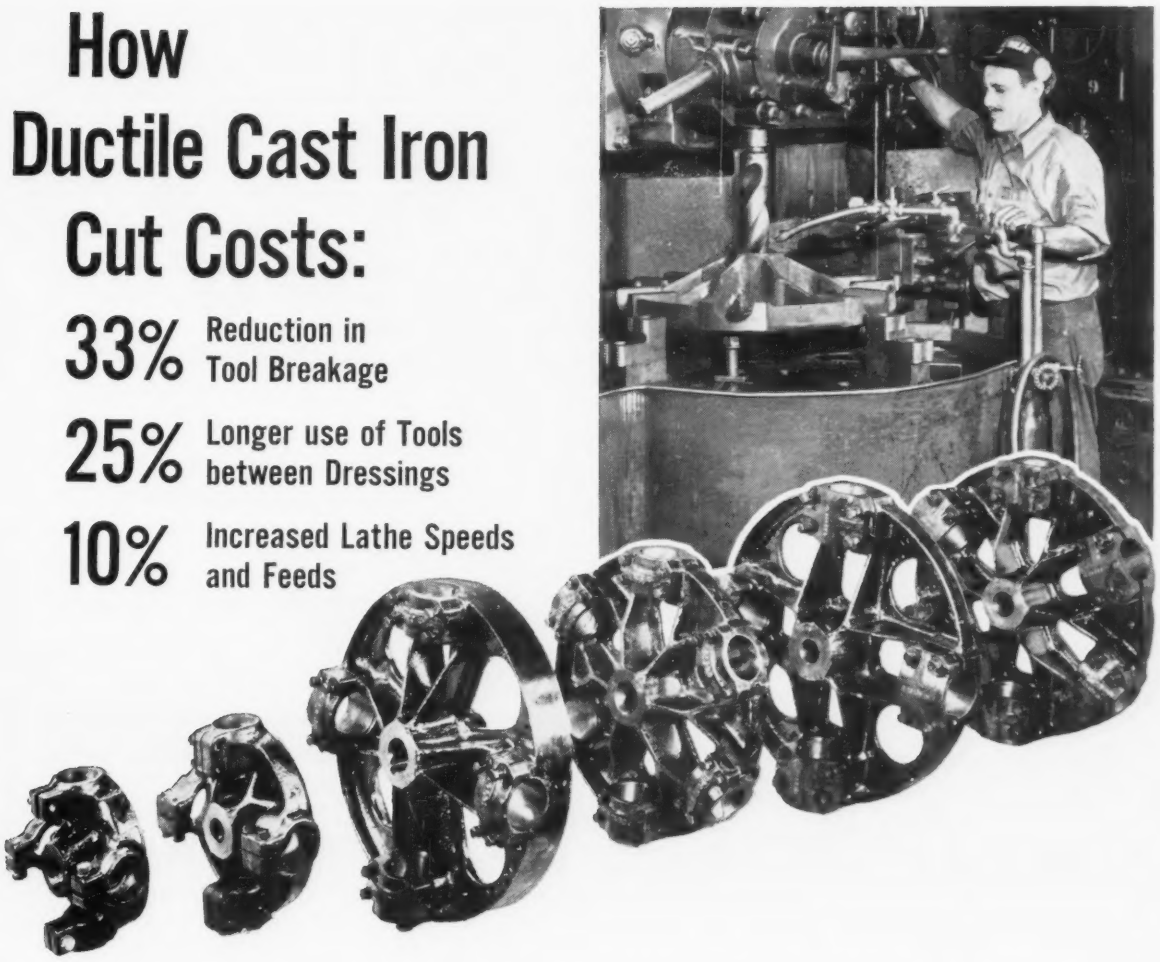
BETHLEHEM STEEL

How Ductile Cast Iron Cut Costs:

33% Reduction in Tool Breakage

25% Longer use of Tools between Dressings

10% Increased Lathe Speeds and Feeds



Who will be next to make better products for less money by using Ductile Cast Iron?

Profit from the example of Metal Products Division of Koppers Company, Inc., Baltimore 3, Md. This manufacturer not only cut costs but improved performance of one of their specialties by adopting Ductile Iron hubs for "Aeromaster" industrial fans.

These propeller-type fans, ranging from 54 inches to 24 feet in diameter, are generally used in pipeline pumping stations and similar places where vibrations from nearby engines, compressors or other machinery compound the vibrations of a fan.

INCO TRADE MARK

For the hubs, which may vary from 50 to 225 pounds in weight, good tensile and fatigue properties are obviously essential. In addition, excellent castability is needed because the heavy center portion, the heavy flange and the thin inter-connecting webs of each hub vary considerably in section thickness.

So far, no Ductile Iron hub has been rejected. The manufacturer sand-blasts hub castings and then heat-treats to provide 60,000 p.s.i. minimum tensile strength and 15% elongation.

Tensile strengths in excess of 150,000 p.s.i. may be attained by other heat-treatments. Investigate how Ductile Iron can improve your products or equipment. Learn the facts about its machinability, its resistance to wear, to shock and vibration. Investigate the facts about its damping capacity.

Send us details of your prospective uses, so that we may offer a list of sources from some 100 authorized foundries now producing Ductile Iron under patent licenses. Request a list of available publications on Ductile Iron... mail the coupon now.

The International Nickel Company, Inc.
Dept. 20, 67 Wall Street,
New York 5, N. Y.

Please send me a list of publications on:
DUCTILE CAST IRON.

Name_____

Title_____

Company_____

Address_____

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THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

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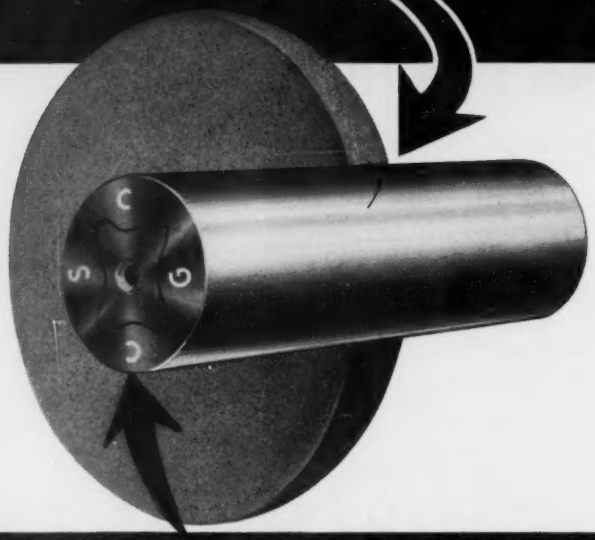
An exclusive GRINDING PROCESS...

makes

CUMBERLAND STEEL BARS

concentric, straight,

smooth & *really* accurate



BE SURE OF THIS MARK ON THE END OF YOUR SHAFTS

CUMBERLAND GROUND BARS FOR ALL TYPES OF MACHINES

They are carefully ground to our standard manufacturing tolerance, plus nothing to minus .002" on diameters 1-1/8" to 2-7/16" inclusive . . . plus nothing to minus .003" on diameters 2-1/2" to 8" inclusive. Closer tolerance can be furnished, if desired. And, remember, Cumberland Steel Bars are the end result of 109 years' experience,—and every bar is *carefully tested* before shipment. The list of Cumberland's customers reads like the "Blue Book" of Industry. Ask for further information.

MANUFACTURED IN THREE SPECIFICATIONS

Cumberland Brand—AISI C-1020/C-1025, Elastic Limit 30,000# Min.
Potomac Brand—AISI C-1040, Elastic Limit 45,000# Min.
Cumsco Brand—AISI C-1141, Elastic Limit 57,000# Min.

CUMBERLAND STEEL COMPANY

CUMBERLAND, MARYLAND, U.S.A.

ESTABLISHED 1845 **INCORPORATED 1892**

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ALL AT SEA?

. . . about machine tool replacement . . . the cost and profit factors involved . . . how best to finance the new equipment you need?

In other words . . .

Is there such a thing as...

A PRACTICAL REPLACEMENT PROGRAM?

YES! — and Jones & Lamson can help you develop it

Industry unanimously endorses the idea of planned replacement of capital equipment. Nevertheless, most of America's machine tools are more than 10 years old, sadly inferior to today's profit-producing equipment. The idea is sound — but action is lacking.

Biggest reason for this paradox is financial. Until recently, replacement required a substantial outlay of capital. In many cases, needed capital was lacking; in others, the capital, though available, had many other calls upon it. Unrealistically low depreciation allowances on capital equipment served as an added deterrent to replacement.

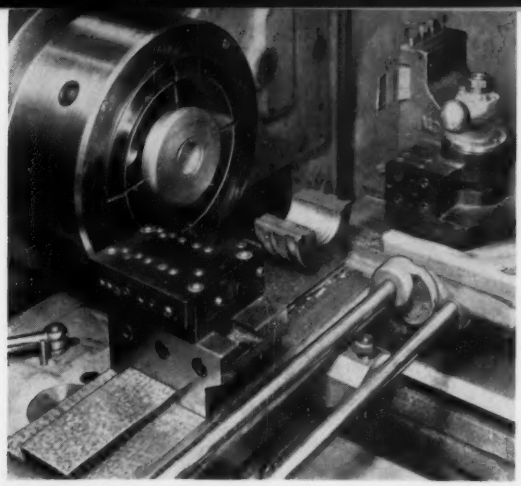
The picture has changed. Now, provisions of our new tax laws permit more equitable write-offs, and make replacement a more attractive proposition.

Jones & Lamson makes replacement even *more* feasible, by clearing away the traditional difficulties of financing with its unique Procurement Plans.

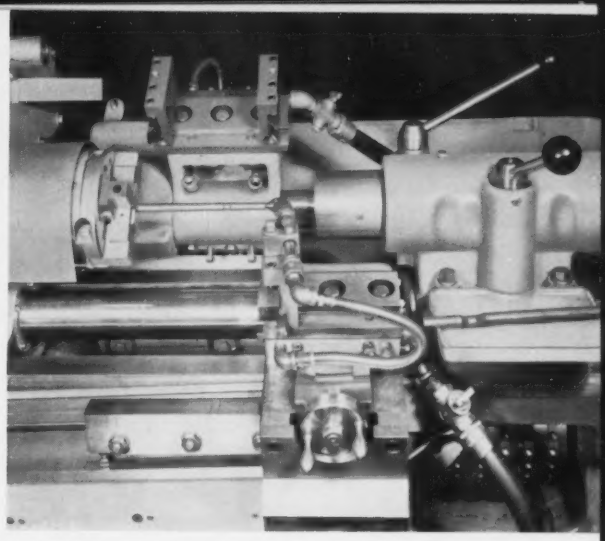
This, then, is what Jones & Lamson offers: modern machine tools that can greatly improve your production; *plus* your choice of several sound, low-cost (interest rates of 3¼%, and lower, add-on) methods of procuring these tools.

OBSOLETE machine tools like these hamper industrial growth, keep production low, and costs high.

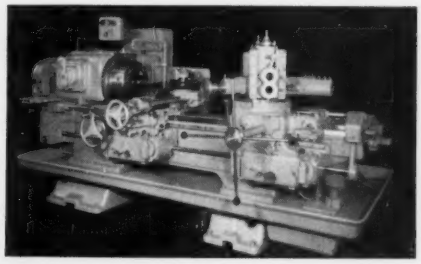
RESEARCH in machining methods, metallurgy, tool geometry, is carried on continually by J & L. Important findings have resulted in the incorporation of unique engineering features in J & L machines.



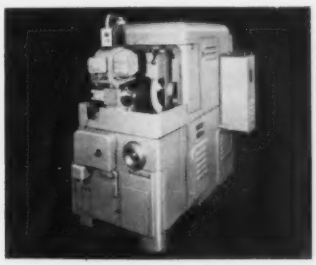
IMPROVED production on this difficult machining job was made possible by J & L engineers' close co-operation with the customer. Research testing, and incorporation of special features on a J & L turret lathe cut time-per-piece on this bottle neck-ring from 14 to 5½ min., increased production 120%!



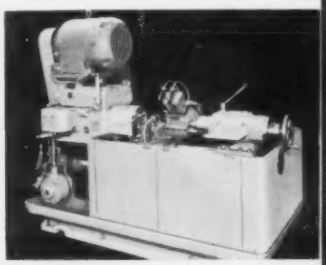
AUTOMATIC OPERATION. One Fay Automatic Lathe replaced eight engine lathes formerly used on this job — and substantially increased production of sewing machine crankshafts at the same time.



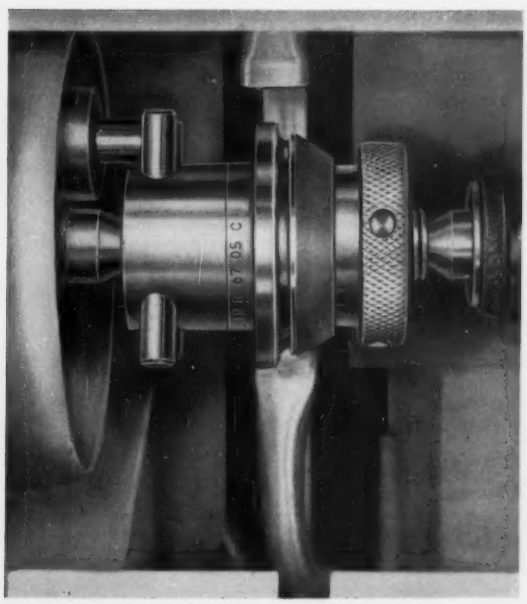
Universal Turret Lathes



Automatic Thread & Form Grinders



Fay Automatic Lathes



GRINDING. This J & L Model "E" Form Grinder, used in producing seaming rolls for the canning industry, completely eliminated a roughing operation, increased production by 100%.

JONES & LAMSON MACHINE COMPANY

512 Clinton St., Springfield, Vt., U. S. A.

Universal Turret Lathes • Fay Automatic Lathes • Automatic Thread & Form Grinders
Optical Comparators • Automatic Opening Threading Dies & Chasers
Automatic Double-End Milling & Centering Machines

Send today for complete details on J & L's machines, methods and Procurement Plans. Simply fill in the coupon below, clip it to your letterhead and mail. We'll do the rest.

JONES & LAMSON MACHINE COMPANY
512 Clinton St., Springfield, Vt., U. S. A.

GENTLEMEN: Please send me the J & L Machine Tool Replacement Information Kit.

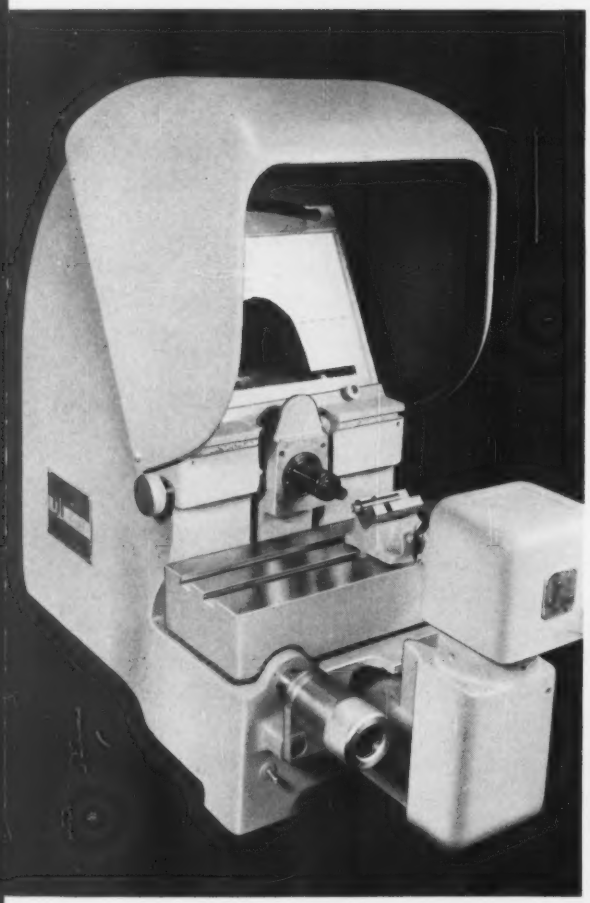
Name.....

Title.....

ACCURATE PRODUCTION INSPECTION AT LOW COST

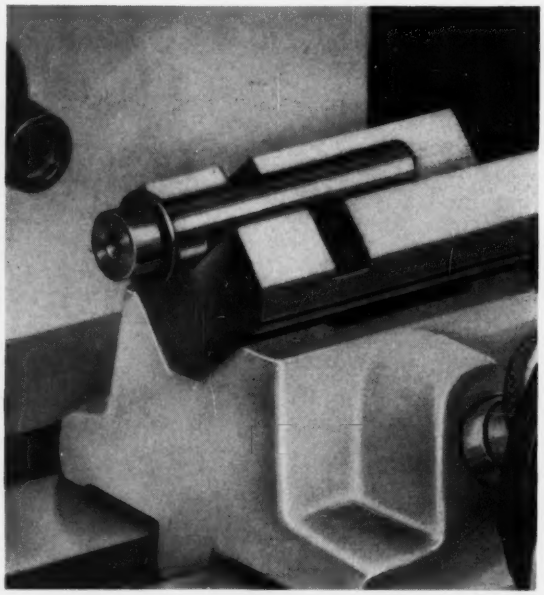
The Jones & Lamson BC-7 Optical Comparator

A versatile... economical... easy-to-operate bench gage



The inspection of "O" rings is a good example of the difficult jobs that are easily handled by the J & L BC-7 optical comparator. The rubber rings are held on a simple plug gage which duplicates their positioning in final assembly. The operator then merely looks at the chart on the viewing screen to check for thickness and amount of flash. The chart is a standard grid, laid out in .050″ squares which represent .001″ on the "O" ring at 50 magnifications.

There is *no* danger of distorting the piece as there would be in mechanical gaging. Only this one gage is used, because the optical comparator inspects in *all* planes.



By merely changing the fixture and chart, a great variety of totally different parts can be inspected accurately and economically.

World's largest manufacturer of Optical Comparators since 1919

JONES & LAMSON MACHINE COMPANY

COMPARATOR DIVISION, 512 Clinton St., Springfield, Vermont, U. S. A.

GAIN EVERY WAY WITH DE LAVAL GRINDING COOLANT CLARIFICATION...

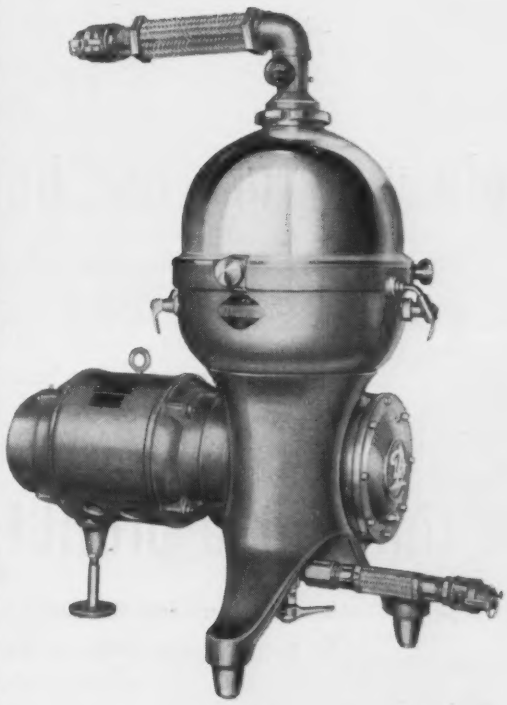
With De Laval "Hermetic"* Coolant Clarifiers you . . .

Get longer grinding wheel life . . . with far fewer shut-downs for wheel dressing.

Reduce coolant cost to a minimum. Grinding coolant, either oil or aqueous, lasts indefinitely, only "make-up" being required.

Get finer finishes...due to complete removal of free abrasive grains from the coolant.

Speed up finishing operations.



It will pay you to investigate the De Laval System of Coolant Clarification. Write today for De Laval Bulletin F6-17.

*Registered Trade-mark

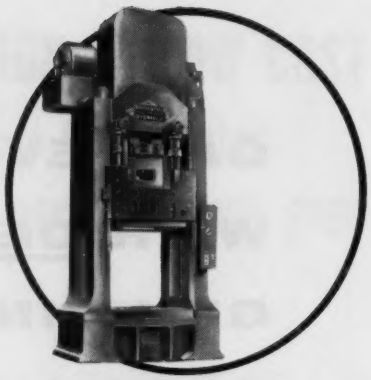
DE LAVAL

purifiers and clarifiers for factory oils

THE DE LAVAL SEPARATOR COMPANY Poughkeepsie, New York • 427 Randolph St., Chicago 6 • **DE LAVAL PACIFIC CO.** 61 Beale St., San Francisco 5

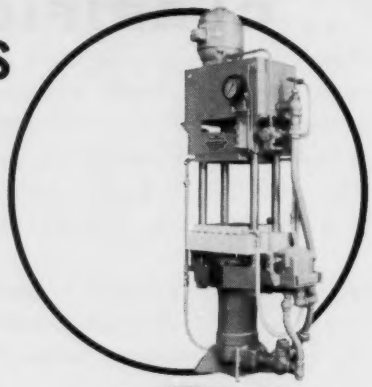
Modern Improvements in

. . . pressure generating systems, operating controls, general design and improved lubrication add greatly to the recognized efficiency of BIRDSBORO Hydraulic Presses.



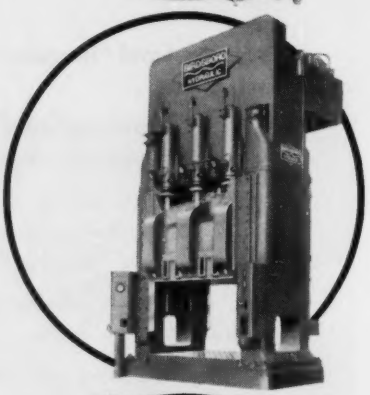
BIRDSBORO hydraulic presses

. . . have an enviable, industry-wide record of production efficiency, reduced rejects, low maintenance costs.



help you turn out better jobs

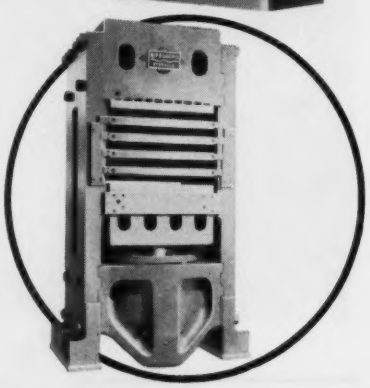
. . . through their constant draw speed for drawing and forming . . . automatic protection against overloading for coining and embossing . . . special safety control for blanking and piercing.



on time, at a profit!

There's a modern BIRDSBORO Hydraulic Press for every press requirement. BIRDSBORO engineers are ready now to help you plan specifications and engineer the proper press for your particular requirements.

HP 18-54



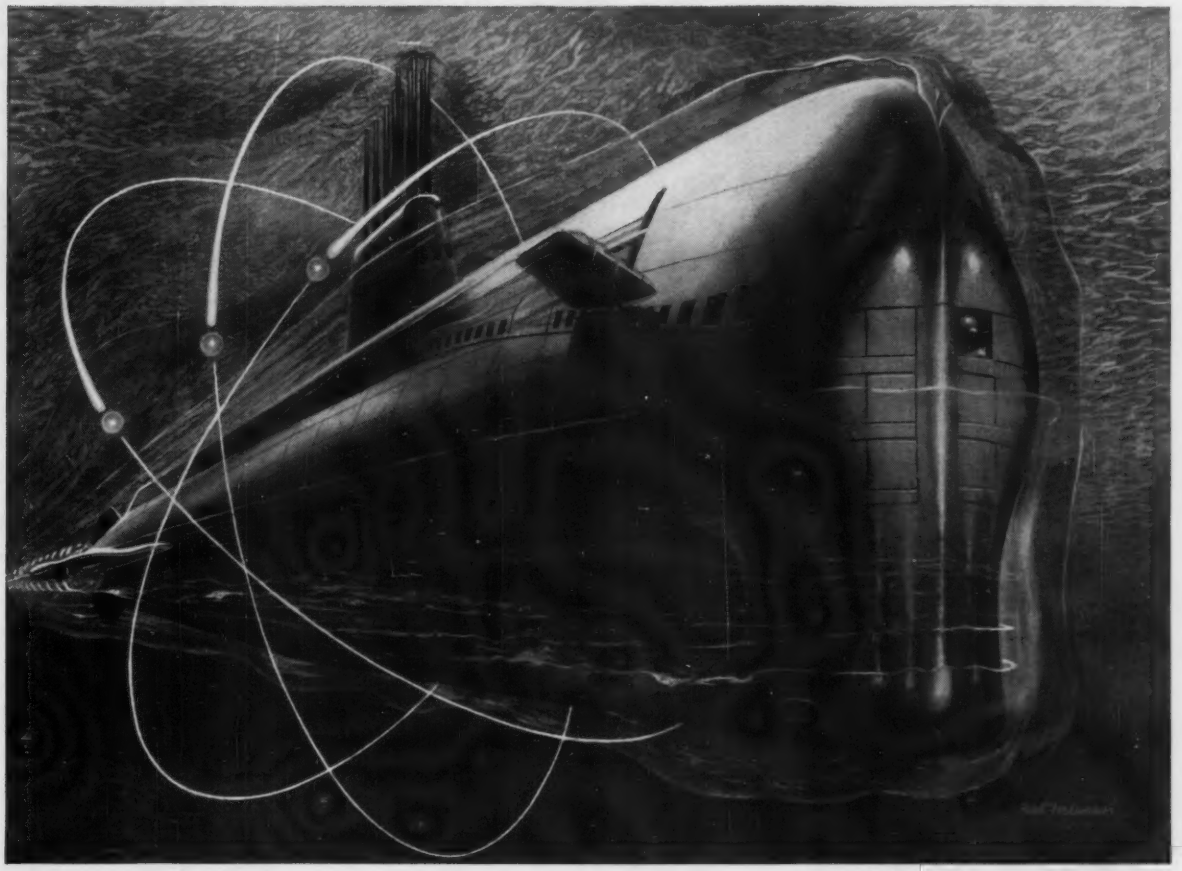
Designers and Builders of:

STEEL MILL MACHINERY
HYDRAULIC PRESSES
CRUSHING MACHINERY
SPECIAL MACHINERY
STEEL CASTINGS
Weldments "CAST-WELD" Design
ROLLS: Steel, Alloy Iron, Alloy Steel

BIRDSBORO

BIRDSBORO STEEL FOUNDRY & MACHINE CO., BIRDSBORO, PENNA. Offices in Birdsboro, Pa. and Pittsburgh, Pa.

For more information on products advertised, use Inquiry Card, page 241



THE "NAUTILUS"

Atomic Sub and Builders Rely on World's Greatest Lubrication Knowledge

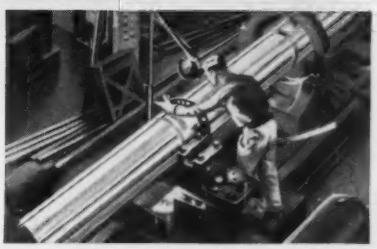
With the launching of the "Nautilus"—world's first atomic-powered submarine—the U.S. Navy crossed the threshold of the atomic age.

Socony-Vacuum is proud that it has been able to play a dual role in this most significant event.

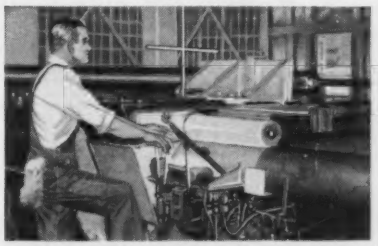
First, famous Socony-Vacuum lubricants are now protecting vital machinery aboard the "Nautilus."

Second, Electric Boat Division, General Dynamics Corp.—builder of the "Nautilus"—relies 100% on our lubricants and a program of Correct Lubrication to protect its plant equipment... has done so for the past 34 years!

We wish the "Nautilus" and her crew all success... pledge our continued cooperation, in every way possible, to the Navy and its suppliers, toward the end of keeping America and her allies strong.



A snorkel intake tube being machined to very precise tolerances on one of the large lathes in the Groton plant.



Hydraulic bender shapes section of 8-in. steel pipe in two minutes. This operation formerly took a full day.

SOCONY-VACUUM *Correct Lubrication*

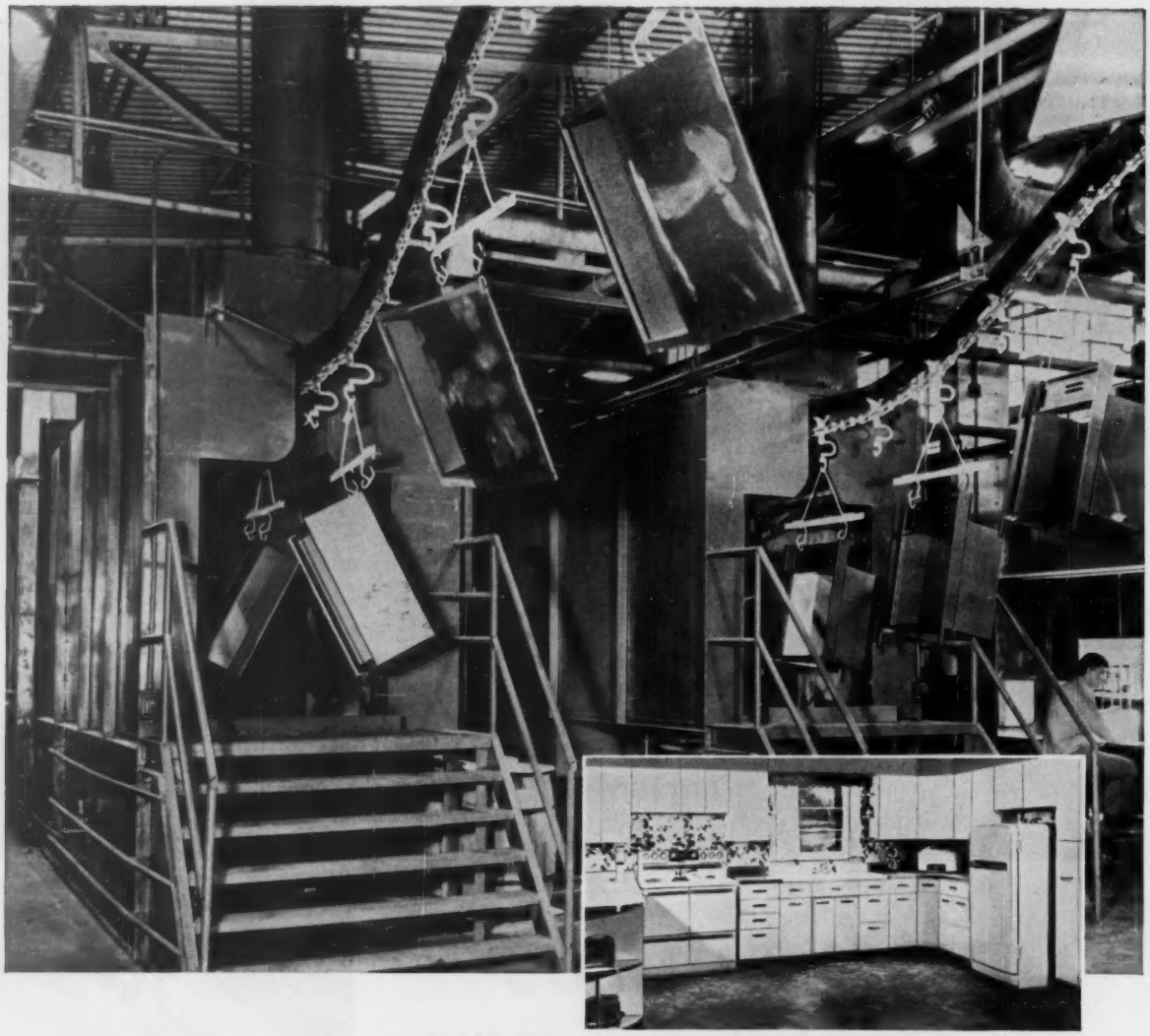
FIRST STEP IN CUTTING COSTS

SOCONY-VACUUM OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP.

SOCONY-VACUUM

For more information on products advertised, use Inquiry Card, page 241

VANADIUM ALLOYS STEEL COMPANY



How to get a "Bulldog Grip" on beauty!

The bright, shiny new paint finish looks wonderful when it comes off the production line. Looks equally fine in the showroom, when the customer makes her choice.

Then it gets out into service, and the real test begins.

Bonderite's "bulldog grip" holds paint finish to metal. In Bonderite installations like the one shown above, the surface of the metal (before painting) is converted chemically to a nonmetallic coating integral with the metal which resists corrosion, confines damage from scratches to the site of the injury itself. It's satisfaction insurance, used today on leading painted products of all types where lasting fine appearance is important.

If you aren't now using Bonderite on your painted metal products, better check up and learn how economically you can have its advantages. Call or write today!

**Bonderite, Bonderlube, Parco, Parco Lubrite—Reg. U. S. Pat. Off.*

Since 1915—Leader in the Field

PARKER RUST PROOF COMPANY

2194 E. Milwaukee, Detroit 11, Michigan

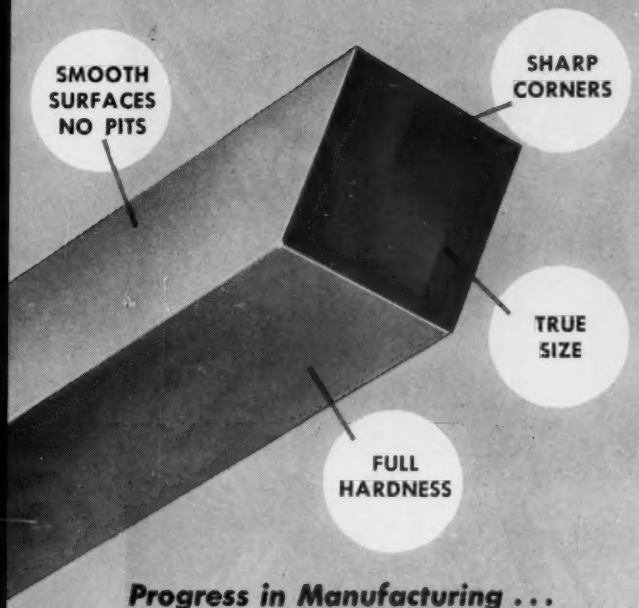
BONDERITE	BONDERITE and BONDERLUBE	PARCO COMPOUND	PARCO LUBRITE	TROPICAL
corrosion resistant paint base	aids in cold forming of metals	rust resistant	wear resistant for friction surfaces	heavy duty maintenance paints since 1883

For more information on products advertised, use Inquiry Card, page 241

VANADIUM-ALLOYS STEEL COMPANY

announces ANOTHER FORWARD STEP in better tool steel service!

TRUE-SHAPE TOOL BITS
at unground bit prices



Progress in Manufacturing . . .

TRUE-SHAPE TOOL BITS at no extra cost

TRUE-SHAPE Tool Bits are accurately dimensioned, sharp cornered, smooth finished, fully hardened when you buy them. And yet you get these improved, modern bits at no increase in cost. ● Order TRUE-SHAPE in your favorite standard grade, and see the difference!

NEW-STYLE PACKAGING
for simplified handling and control

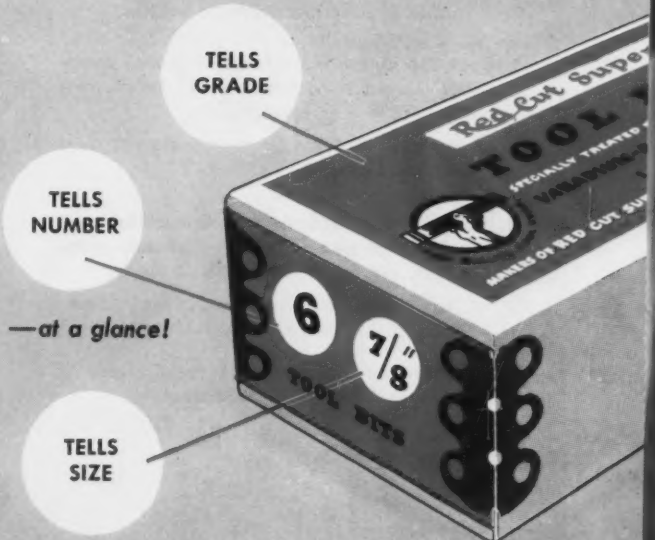
Progress in Packaging . . .

EACH TRUE-SHAPE SIZE HAS A BOX TO FIT

No "compromise" boxes and messy filler material for TRUE-SHAPE Bits! Each bit size has its own size box—speeds handling and inventory control—saves time all around. Write for descriptive folder.

Order your TRUE-SHAPE Tool Bits in the new package in any of the following grades:

RED CUT SUPERIOR	VASCO M-2
RED CUT COBALT	NEATRO
RED CUT COBALT B	E.V.M.



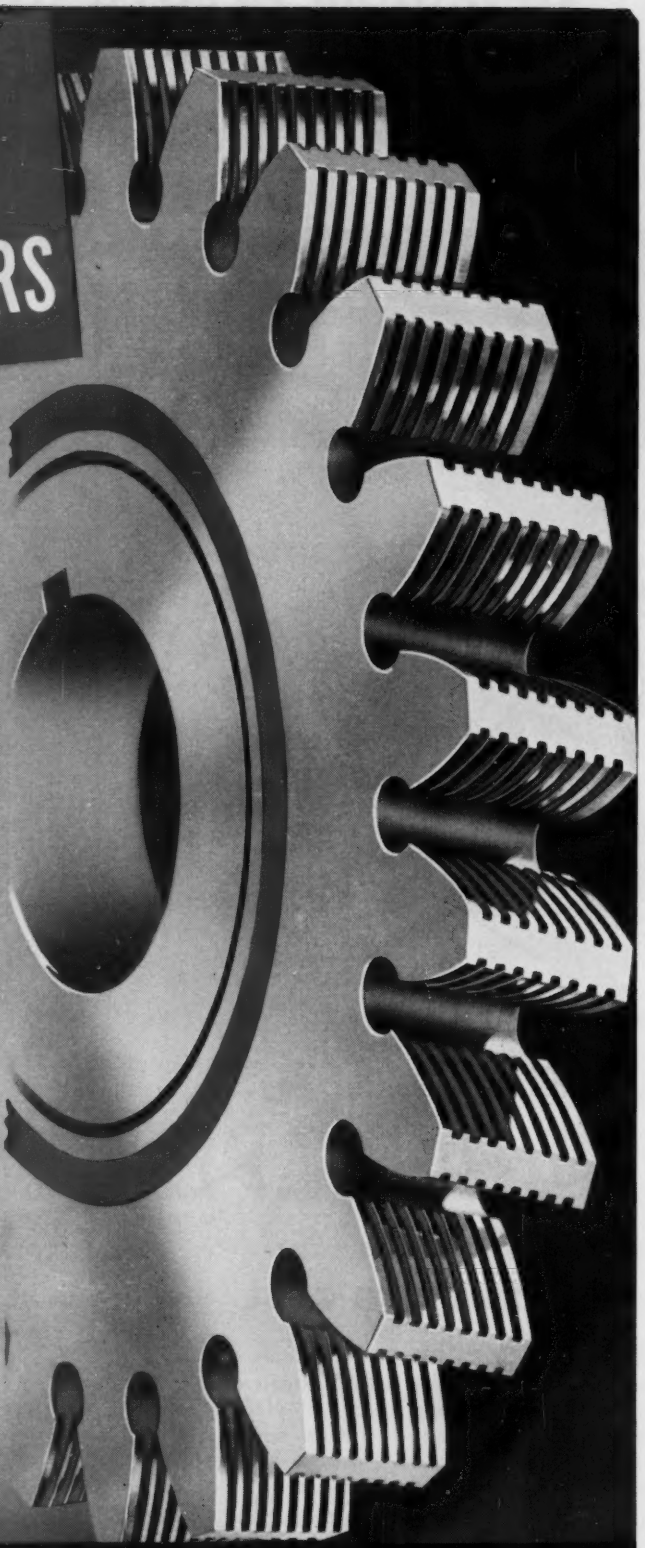
VANADIUM-ALLOYS STEEL COMPANY

Manufacturers of First Quality Tool and Die Steels • **Latrobe, Pennsylvania**

COLONIAL STEEL DIVISION • ANCHOR DRAWN STEEL COMPANY

In Canada: **Vanadium-Alloys Steel Canada Limited, London, Ontario**

CHECK LIST FOR BUYERS OF SHAVING CUTTERS



Knowing the absolute necessity for QUALITY in your gear shaving cutters, you might consider these points the next time you order.

1. How much experience does the cutter manufacturer have?

   Since 1932 when National Broach built the first Rotary Gear Shaving Machine, this company has always been the largest producer of shaving cutters.

2. Has the cutter manufacturer a staff of engineer specialists who concentrate exclusively on cutter design?

   National Broach has such a staff.

3. Does the cutter manufacturer heat treat his own tools and is his grinding department temperature controlled?

   Every Red Ring Cutter is heat treated and controlled by Red Ring metallurgists and ground on special Red Ring grinders under precise temperature control.

4. Does the cutter manufacturer prove every cutter design by actual try-out in his own plant before it is released?

   No new Red Ring cutter design is ever released otherwise.

5. Is the cutter manufacturer prepared to assist you in cutter development — involute modification, etc. when needed?

   National Broach has always maintained such a service for you.

For further information, write for Chapter 2, Modern Methods of Gear Manufacture.

SPUR AND HELICAL GEAR SPECIALISTS ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORM

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

7029

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

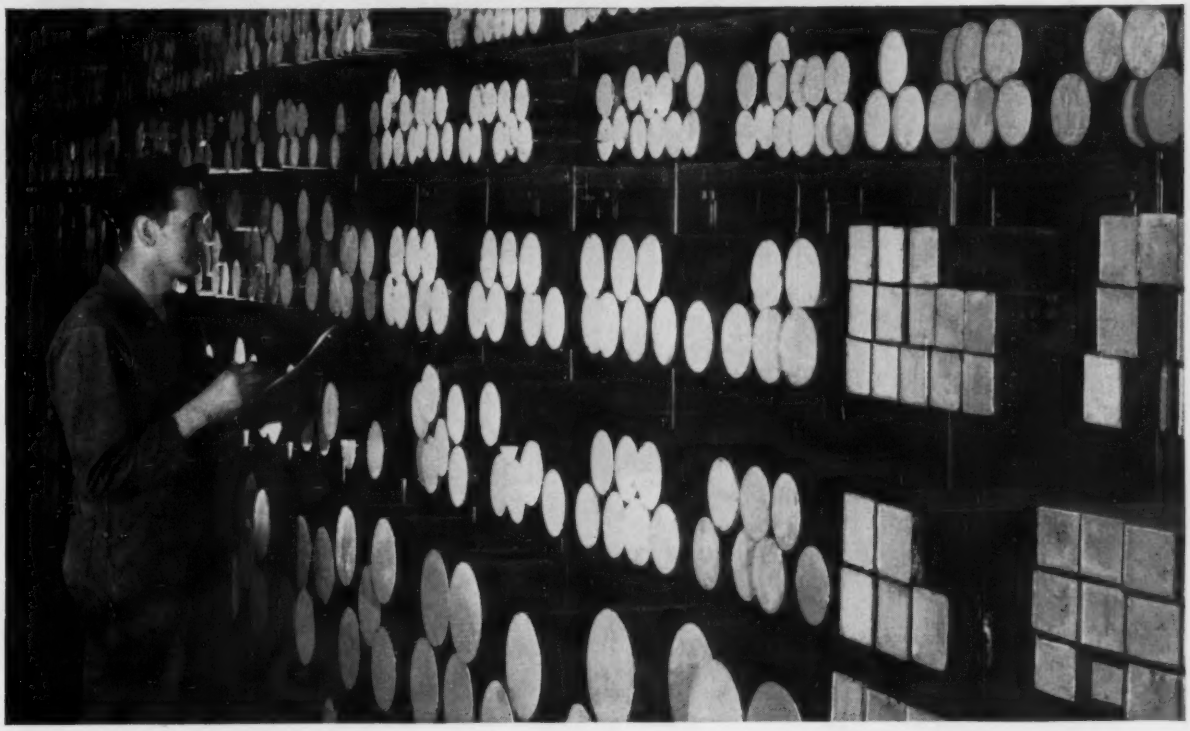
For more information on products advertised, use Inquiry Card, page 241

Tool Steel Topics

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation



Want Fast Tool Steel Service?

SEE YOUR BETHLEHEM DISTRIBUTOR

Whether you want to order a short bar of tool steel, or merely wish advice about some phase of heat-treating, you're sure to find your Bethlehem tool steel distributor anxious to be of service.

For prompt service is your distributor's middle name. Why else does he make it a point to know your city like a book — its background, its people, its industry? He knows what kinds of steels you are most likely to need, and in what quantities. And so he keeps large stocks of Bethlehem tool steel on hand, in a variety of sizes and quantities, ready to go at a moment's notice.

If you want bars cut to special length, or if there's some tricky phase of metallurgy or any other tool steel problem troubling you, again your distributor is at your beck and call. He's a real friend.

66 HS and XX Team Up in Difficult Nut-Forming Application

The hexagonal punch and doming die, each quenched and drawn to a Rockwell C hardness of 61-63, are used in a cold-forming operation by a maker of nuts. The punch is made of 66 High-Speed. It is doing an outstanding job in holding close tolerances because of its excellent resistance to wear. The XX Carbon Steel die also provides good wear resistance, as well as resistance to shock, its high surface hardness and tough core enabling it to withstand repeated blows of the punch.

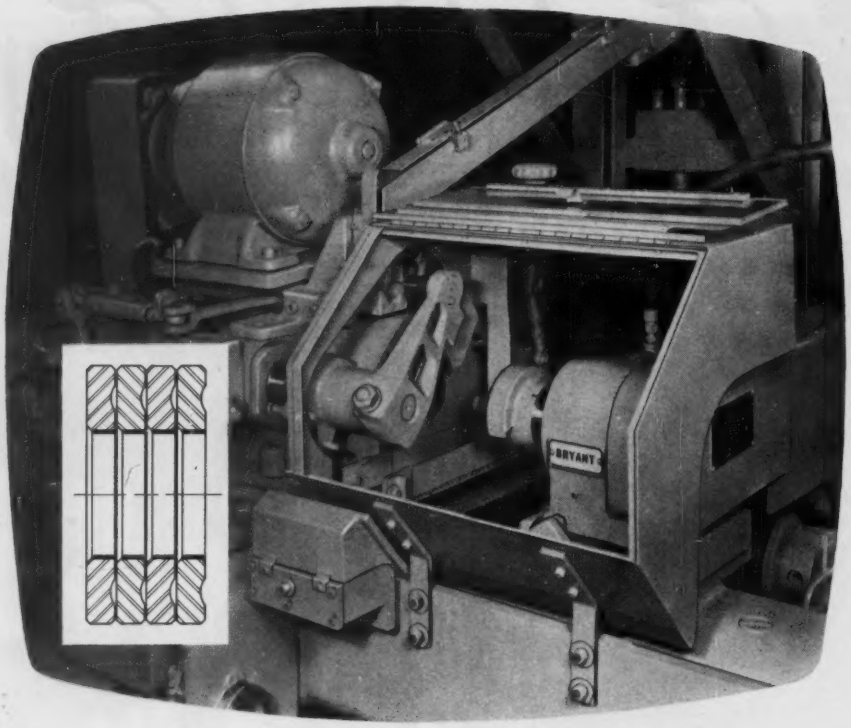
BETHLEHEM TOOL STEEL ENGINEER SAYS:

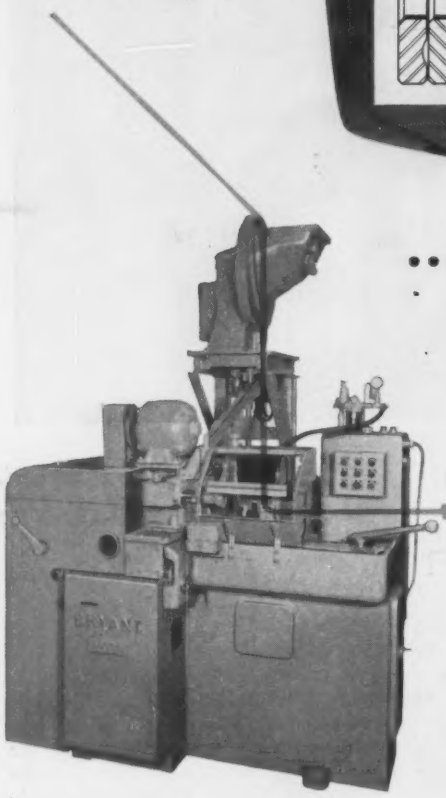
Scale is Tough Stuff

Whenever hot-rolled scaled stock is used in place of cold-rolled stock, the service life of the punches and dies drops to as much as a third of normal, largely because of the abrasion of the scaled hot-rolled surface on the cutting edges of the tools. The peculiarities of each situation determines whether or not such a substitution is economical.

So the question is often asked: What can be done from the tooling end to avoid decreased production? If punches and dies are normally made from water-hardening carbon tool steel, or from manganese oil-hardening steel, decreased tool life can be avoided by changing to a high-carbon, high-chromium steel, such as Lehigh H or S. Such a change would largely overcome the disadvantage of hot-rolled scaled stock. But if high-carbon, high-chromium steels are already being used, effecting an appreciable improvement can be accomplished only through special heat-treatment, such as short-cycle hardening, or nitriding.

CUT HIGH COSTS





...with BRYANT automatic internal grinders

This grinding operation demonstrates how Bryant Grinders can be integrated into production lines for maximum efficiency.

In this operation, four thrust bearing rings are ground internally, at one chucking, on a Bryant 2209D with hopper and stacker attachments. The rings (which have been ground on both faces in the previous operation) pass from an overhead conveyor into the hopper. The stacker then groups them in fours for loading by the automatic loading device. A clamp chuck holds the rings while they are ground—520 per hour, at 100% efficiency, to 1.003/1.005". .012" to .017" stock is removed—to the required 20 micro-inch finish. Diamond sizing automatically controls the tolerance requirements.

The discharge device then removes the rings from the chuck and places them on a second conveyor which carries them to the next operation.

Bryant grinders offer you operating economy—as well as peak production rates. Their precise alignment helps ensure maximum accuracy and minimum maintenance—factors that cut cost per piece.

Write for our "Alignment" booklet. Ask, too, for a reservation card for our new sound, color movie "Alignment for Better Internal Grinding"—free showings arranged for engineering groups.

BRYANT

chucking grinder co.

SPRINGFIELD, VERMONT, U.S.A.

Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates

For more information on products advertised, use Inquiry Card, page 241

How the use of NATIONAL Seamless EXTRUDED Stainless Tubing *cuts nut manufacturing costs*

USING NATIONAL Seamless EXTRUDED USS Stainless (type 303) Tubing, the Tri-Clover Division of Ladish Corporation is now turning out hexagonal nuts in less time and at lower cost than they could using solid bar stock. The savings in material cost alone amounts to 11.77 cents per piece.

All machining on the nuts, except threading and O.D. finishing, is done in one operation on a 6-spindle, 3½ inch Conomatic automatic machine. A saving of five seconds in the time cycle was made by using the extruded hexagonal stock versus bar stock. The use of hex tubing has eliminated the cost and upkeep of boring tools —and, because tubing is considerably lighter than bar stock, it can be handled faster and with less difficulty.

NATIONAL EXTRUDED Tubing offers you high strength, uniformity, and dependability that only *seamless* tubing can give. For a better precision part, involving fewer operations and fewer machine hours, investigate NATIONAL Seamless EXTRUDED Tubing—made by the world's largest manufacturer of tubular steel products. Feel free to call our engineers if you'd like help in applying NATIONAL Seamless to your product.

* * *

National Tube employs a hot-extrusion process known as "Sejournet" in which white-hot billets of steel are squeezed into tubing of various shapes by a 2,500-ton hydraulic press and ram—a manufacturing method that insures absolute uniformity of wall strength.

NATIONAL TUBE DIVISION
UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
(Tubing Specialties)

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS TRADE MARK

NATIONAL Seamless EXTRUDED TUBING

UNITED STATES STEEL

UNIVERSAL BORING CHUCKS

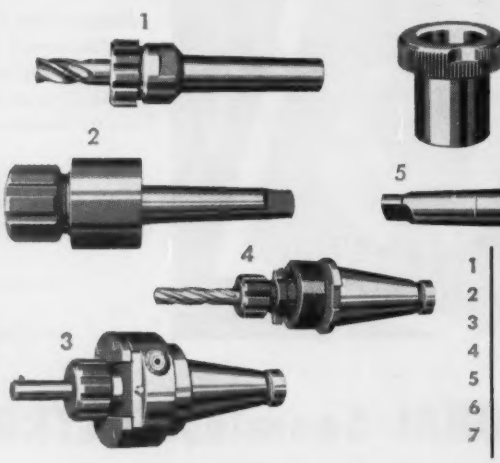
FOR ALL TYPES OF ROUGH AND FINISH BORING

COMPLETELY ENCLOSED MECHANISM KEEPS OUT DUST AND GRIT
COMPACT AND RIGID FOR ROUGH BORING WITHOUT CHATTER; PRECISE AND ACCURATE FOR FINISH BORING
POSITIVE BUILT-IN CENTER STOP FOR MILLING, DRILLING AND REAMING
HARDENED AND GROUND WEARING PARTS FOR LASTING, TROUBLE-FREE PERFORMANCE
ACCURATELY BALANCED FOR THE HIGH SPINDLE SPEEDS OF MODERN BORING MACHINES

Write to Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.; or the home office.

183

UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH 2,
MICHIGAN



1 STANDARD COLLET CHUCK
2 FLOATING COLLET CHUCK
3 BORING CHUCK
4 "KWIK-SWITCH" TOOL HOLDER
5 MIKRO-LOK BORING BAR
6 STANDARD DRILL BUSHING
7 UNIVERSAL INDEX PLUNGER

For more information on products advertised, use Inquiry Card, page 241

from interchangeable parts...

Danly Die Set Service is Faster!

Choose the Danly Branch closest to you—

BUFFALO 7	1807 Elmwood Avenue
CHICAGO 50	2100 S. Laramie Avenue
CLEVELAND 14	1550 East 33rd Street
DAYTON 7	3196 Delphos Avenue
DETROIT 16	1549 Temple Avenue
GRAND RAPIDS	113 Michigan Street, N.W.
INDIANAPOLIS 4	5 West 10th Street
LONG ISLAND CITY 1	47-28 37th Street
LOS ANGELES 54	Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE 2	111 E. Wisconsin Avenue
PHILADELPHIA 40	511 W. Courtland Street
ROCHESTER 6	33 Rutter Street
ST. LOUIS 8	3740 Washington Blvd.
SYRACUSE 4	2005 West Genesee Street

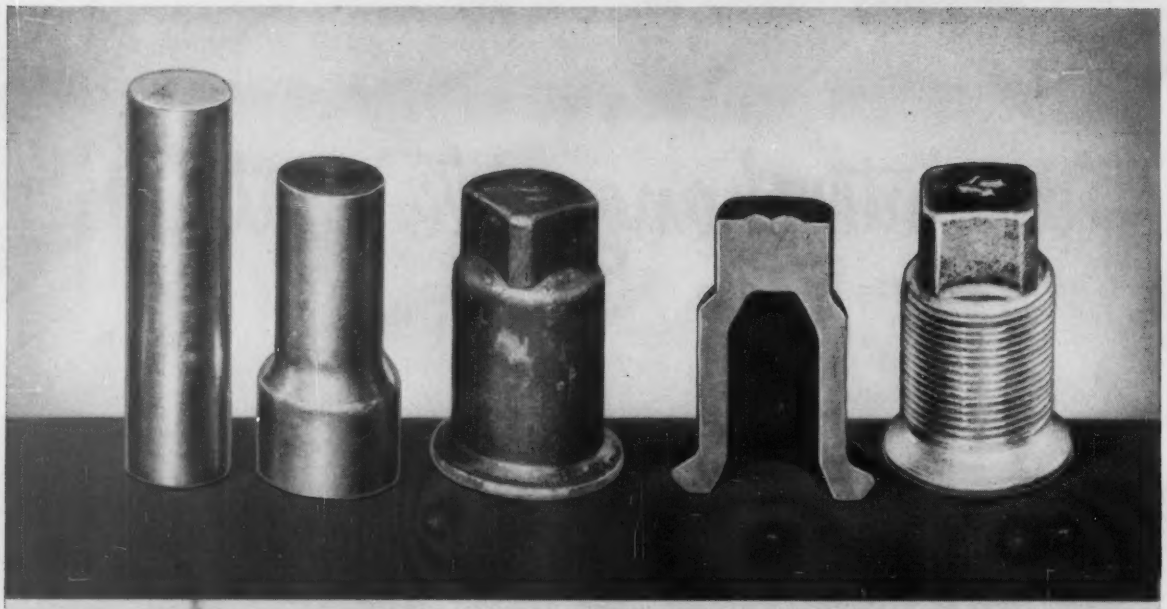
One of the main reasons for Danly's faster die set service is the *interchangeability* of die set parts achieved by Danly. It starts at the main Danly Plant where die set components are produced to Danly's traditional high quality, precision standards. The faster service cycle continues at all of the Danly Branch Plants where thousands of *interchangeable* die set components are stocked. The cycle is completed at the Danly Branch in your area where these parts are assembled as a die set to meet your specific requirements and shipped as soon as your order is received. So remember—for the best in die sets in the shortest time, the place to call is your local Danly Branch.

DANLY

DIE SETS . . .
STANDARD OR SPECIAL
DIEMAKERS' SUPPLIES

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue
Chicago 50, Illinois

...to finished die sets



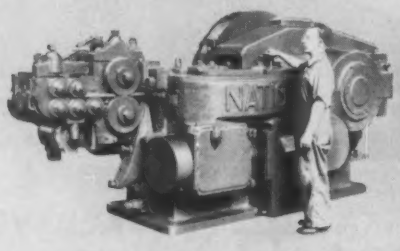
Budd WHEEL NUTS FORGED BY THE MILLION!

This is how the Budd Co.'s progressive Detroit plant has been forging truck wheel nuts by the million, day in and day out, for the past seven years.

In the sequence above, the forging blank is automatically cold headed from coiled hot rolled stock in a National 3/4-inch Double Stroke Solid Die Cold Header. After heating, blanks are forged in a High Speed Forging MAXIPRES of 300 tons capacity.

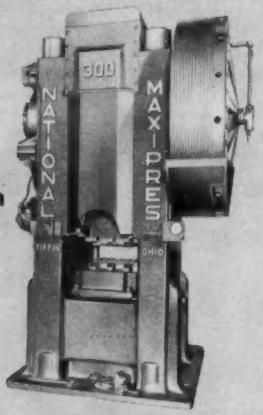
This is one of the first combinations of cold heading and hot forging. Budd has amassed an enviable record of production and material saved by the above method.

If you need to make metal parts faster, stronger and at lower cost, let us work with you. Send us your prints and samples, or better yet, visit us. No obligation.



NATIONAL ¾ in. Cold Header

NATIONAL 300 Ton MAXIPRES



NATIONAL MACHINERY COMPANY
TIFFIN, OHIO—SINCE 1874

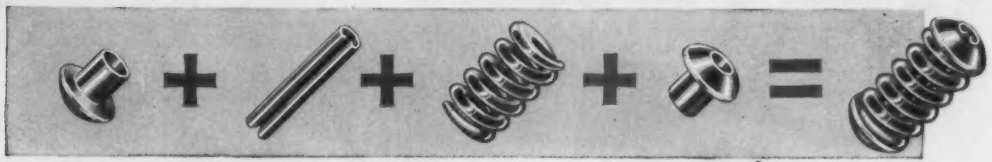
DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS • BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS

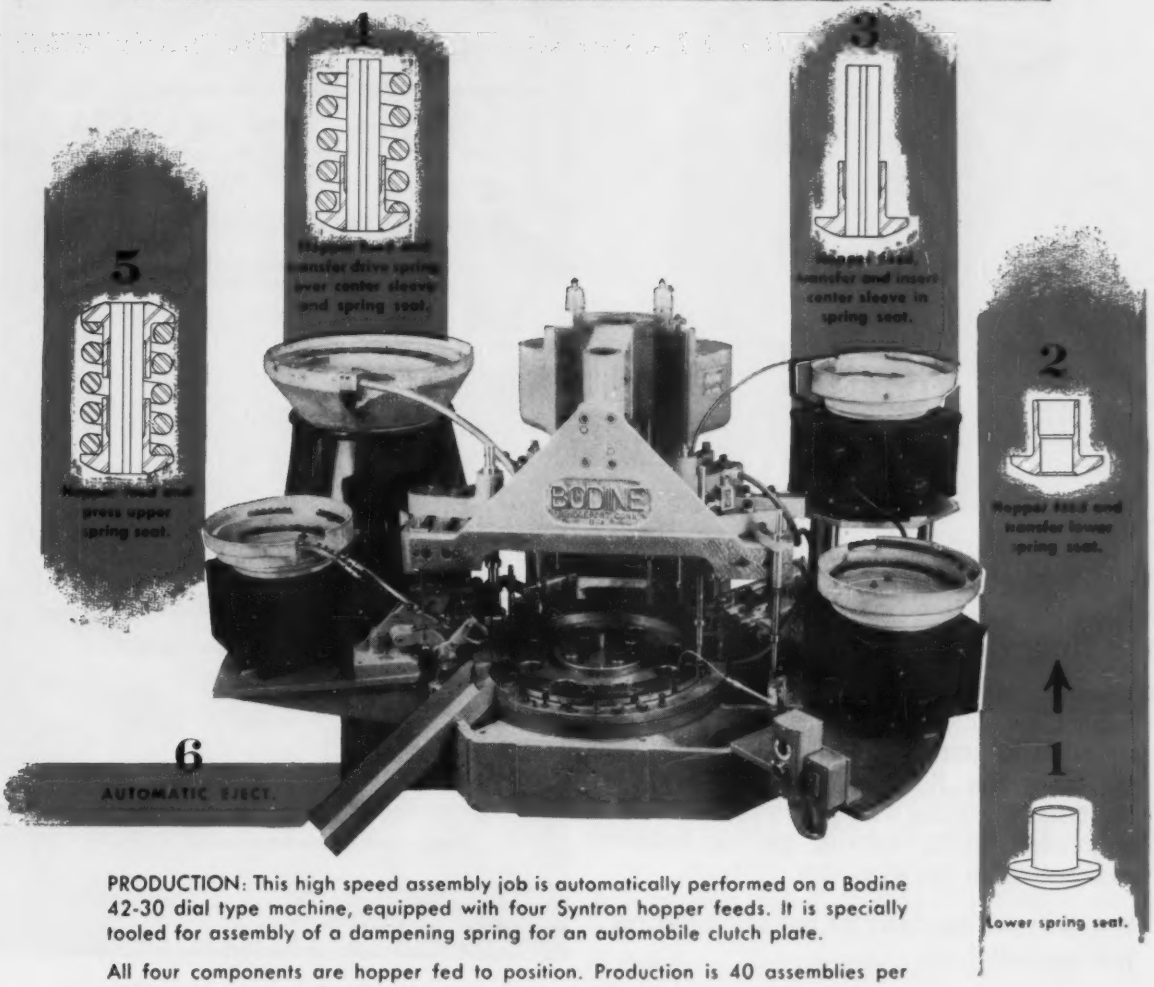
Hartford Detroit Chicago

For more information on products advertised, use Inquiry Card, page 241

Bodine CASE HISTORY NO. 33

Bodine ASSEMBLES A DAMPENING SPRING *AUTOMATICALLY*





PRODUCTION: This high speed assembly job is automatically performed on a Bodine 42-30 dial type machine, equipped with four Syntron hopper feeds. It is specially tooled for assembly of a dampening spring for an automobile clutch plate.

All four components are hopper fed to position. Production is 40 assemblies per minute . . . automatically ejected.

Bodine engineers can solve your problems for repetitive production of small parts . . . milling, drilling, tapping or assembly, automatically . . . at low cost. Write Dept. M-2.

You Can't Meet Tomorrow's Competition

With Yesterday's Machine Tools

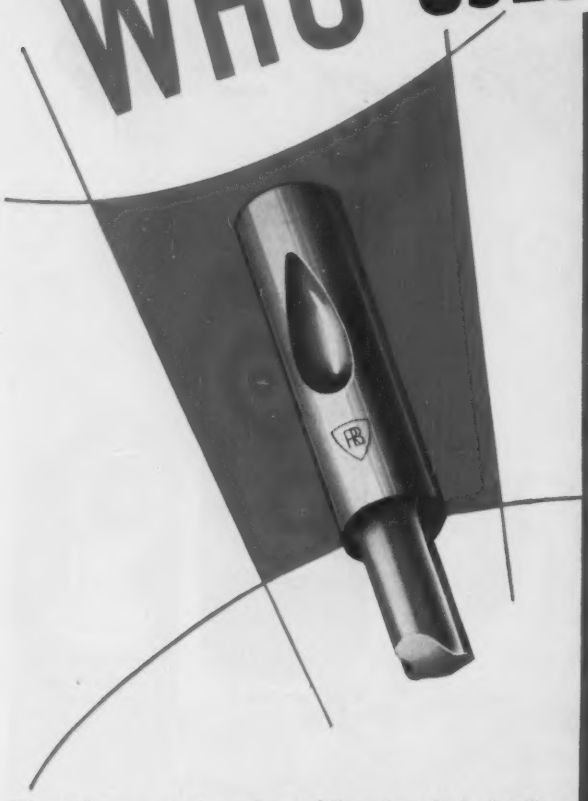
THE **Bodine** CORPORATION

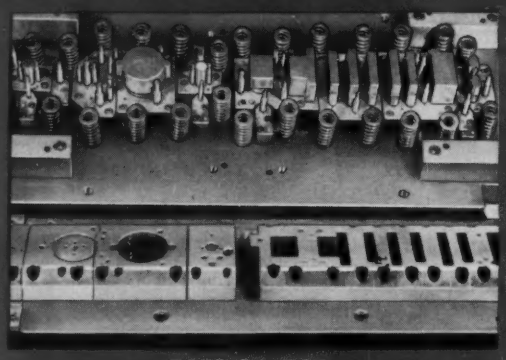
BRIDGEPORT 5, CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

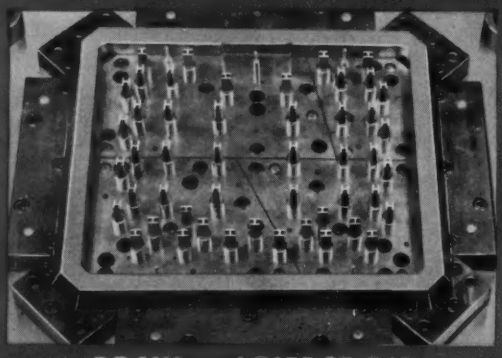
3BD52

WHO USES R-B PUNCHES

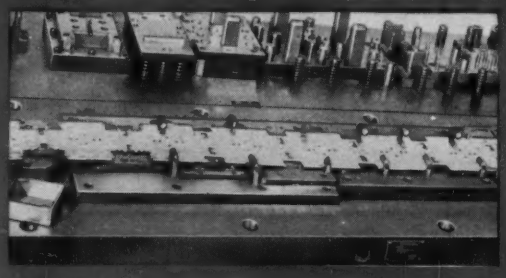




PIERCE DIE



DRAW and PIERCE DIE



PROGRESSIVE DIE

Through many years of providing America's leading industries with interchangeable and standardized punches, die buttons and retainers, R-B has built a reputation for increasing production, lowering costs and saving time. R-B case histories of savings and benefits include users of cam actuated, multi-station progressive, forming, blanking, piercing, embossing and combination dies of all sizes and types.

Why don't you investigate the cost saving features of R-B equipment?

Use R-B Engineering Service for Your Tough Piercing Problems.

RICHARD BROTHERS PUNCH DIVISION
ALLIED PRODUCTS CORPORATION
DEPT. 79 • 12619 BURT RD. • DETROIT 23, MICHIGAN

Please send me additional information.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE ____ STATE _____

Also Produced in
OTHER ALLIED PLANTS
SPECIAL COLD FORGED PARTS
STANDARD CAP SCREWS
PRECISION GROUND PARTS
SHEET METAL DIES MADE OF FERROUS ALLOYS, ZINC ALLOYS OR PLASTICS

For more information on products advertised, use Inquiry Card, page 241

What's Behind This Cutting Oil Picture?

Behind this cutting oil picture there's a story well worth telling . . . a story of 10 years' operation of the M. O. Devers Screw Machine Products Company.

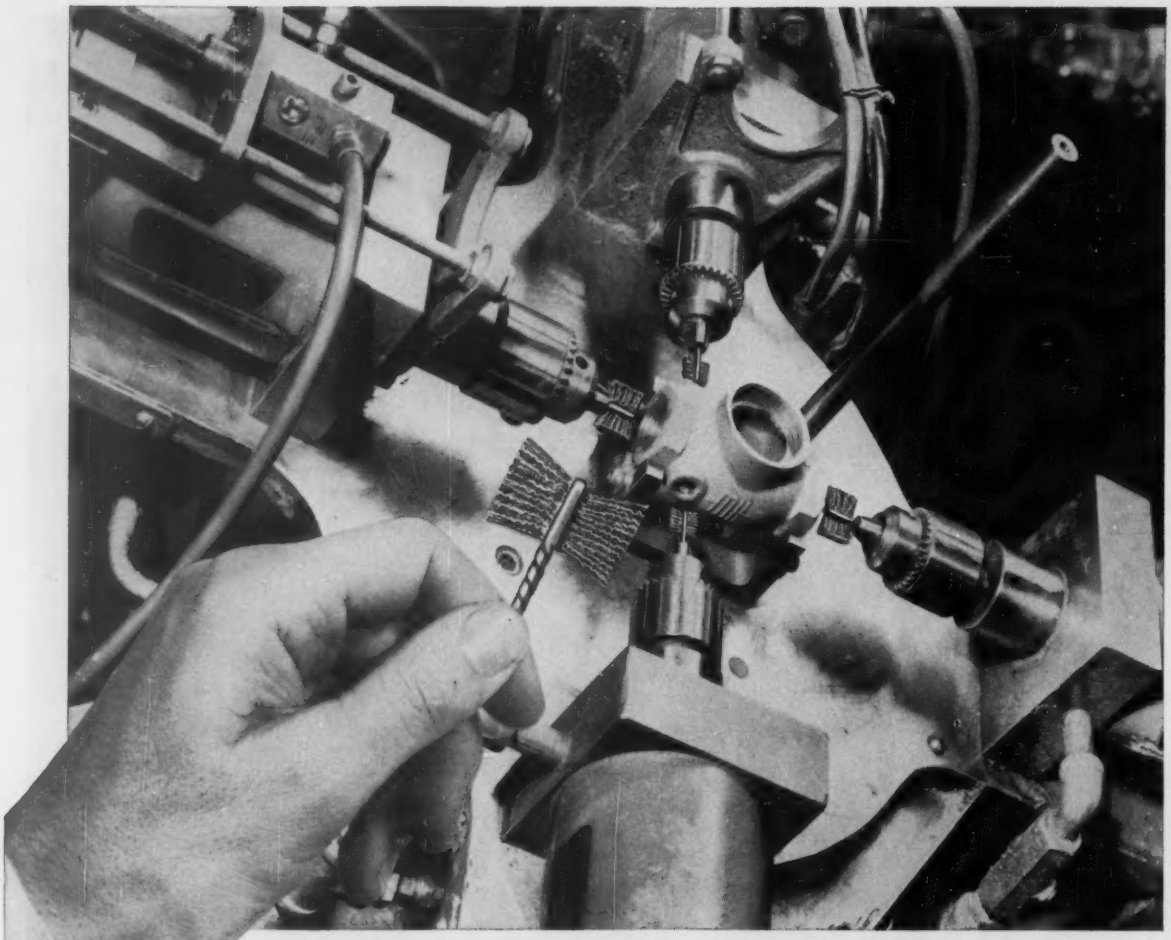
During this time Devers has acquired and maintained a reputation for turning out the very highest quality precision machined parts and turning them out on time.

And during this same period, the oil that has helped Devers to achieve this enviable record is Cities Service Chillo #10 Cutting Oil. This one unusual oil has been used for work covering 1018, 1020, 4140, and stainless steel, and, says Devers official Harry E. McDaniel, "We have found it superior for all these machining operations."

For longer tool life, closer tolerances, and a simpler cutting operation, you—like the M. O. Devers Company—will find it profitable to investigate Cities Service Chillo Cutting Oils. Contact your nearest Cities Service representative or write Cities Service Oil Company, Sixty Wall Tower, New York 5, N.Y.

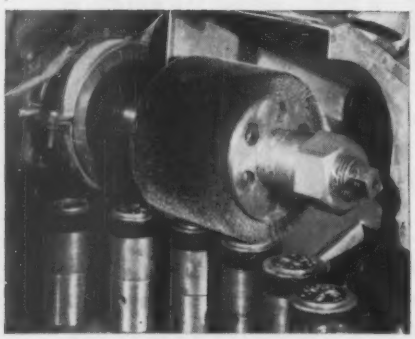
CITIES SERVICE

QUALITY PETROLEUM PRODUCTS



Production idea does job 66% faster

An OBA can speed your operations, too



PRODUCTION UP, COSTS DOWN. *Osborn Economy® Brushes finish both sides of brass discs at a 15,000-per-day rate. Another case of power brushing doing a faster, more thorough job than a former hand method.*

HERE, Osborn Power Brushing saves eight manhours per 1000 parts. Before brushing, burrs on threads were removed from each hole by hand. Now, four holes are brushed at one time . . . 66 per cent faster than before. Setup is simple, results are uniform, production steady, cost is less.

Substantial savings can be made on many types of production with Osborn Power Brushing. An **OBA**, **O**sborn **B**rushing **A**nalysis, will show you how. Call or write *The Osborn Manufacturing Company, Dept. D-26, 5401 Hamilton Avenue, Cleveland 14, O.*

Osborn Brushes

OSBORN

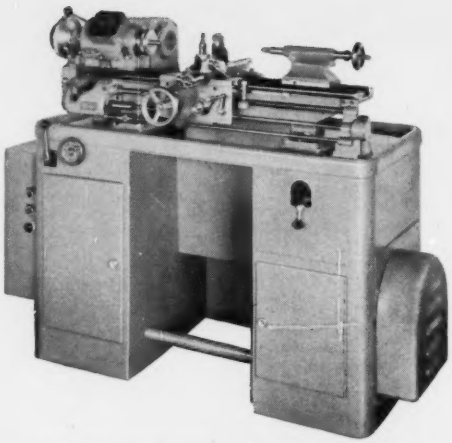
BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES
BRUSHING MACHINES • FOUNDRY MOLDING MACHINES

HERE'S A WAY TO Cut Costs
LAMINUM® shims are easily and quickly adjustable. The laminations of brass, steel or aluminum are held together by a microscopic binder. They p-e-e-l for fast, accurate assembly. No counting of loose layers, no stacking, no miking. Less machining and finishing. Save in maintenance adjustments, too.
LAMISOL® shims, with layers tack-bonded at edges, are also available in brass, steel, stainless steel, aluminum.
LAMINATED SHIM COMPANY, INC.
100 UNION STREET
GLENBROOK, CONN.
Send for FREE Brochure on how to save with Laminum Shims and Lamisol Shims

obsolete machines are costing you *plenty!*

. . . you can make money with these 4 Wade precision machines

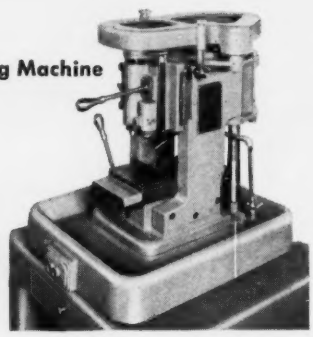
To keep pace with your competition, you need the latest, *most efficient* production machines you can buy. Here are four that are remarkably accurate — designed and built throughout for precision work to close tolerances. Some of the features on each machine are patented and exclusive. All machines are carefully described in Bulletins, available on request.



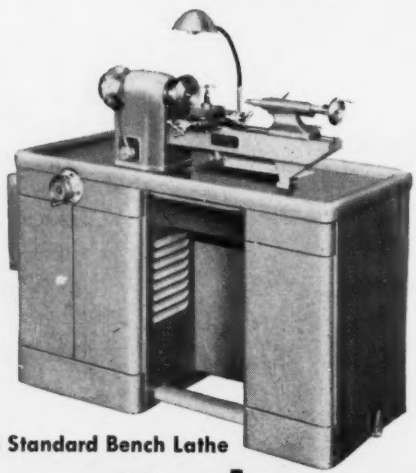
No. 8A Tool Maker's Precision Lathe

A variable speed feed for the feed rod is available as optional equipment. It provides an independent powered longitudinal or cross feed which permits the operator to change the rate of feed while the tool is under cut to secure the desired work finish during turning, facing or boring operations. The rate of feed for variable speed feed is controlled by a potentiometer.

Hand Profiling Machine



No. 73 Hand Screw Machine



No. 73 Standard Bench Lathe

Write to **52 RIVER STREET**

THE WADE TOOL CO.

WALTHAM 54, MASS., U. S. A.

MAKERS OF PRECISION TOOLS FOR AMERICAN INDUSTRY

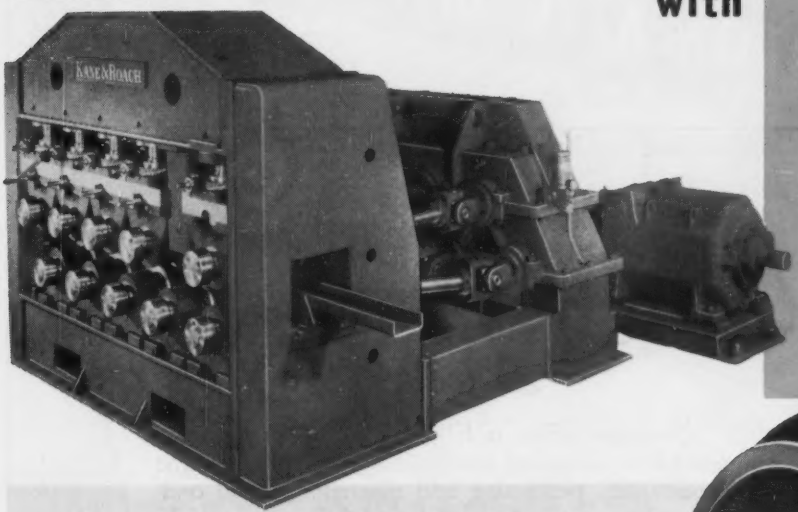
For more information on products advertised, use Inquiry Card, page 241

10-ROLL HORIZONTAL STRAIGHTENER

equips all inboard and outboard roll shafts

with

ORANGE "STAGGERED" ROLLER BEARINGS



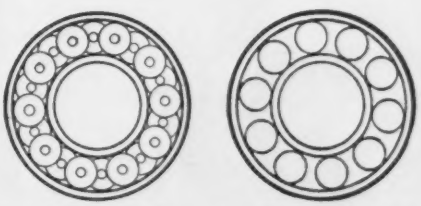
"High radial load capacity—long life—low maintenance cost", reports Kane & Roach, Inc.

The K & R 4AU Horizontal Straightener straightens stainless steel channels, bars, road scraper blades and other heavy sections. Capacity—3″ square stainless steel, 100,000 lb. yield; 5″ x 1″ stainless steel on edge, 100,000 lb. yield. Since 1940, Kane & Roach, Inc., Syracuse, N. Y. has relied upon Orange "Staggered" Roller Bearings to carry the load imposed on the straightener rolls . . . 10 on the inboard and 10 on the outboard roll shafts.

Outstanding for Heavy-Duty Service

Wherever radial loads are extremely heavy and operating conditions are unusually severe, install Orange "Staggered" Roller Bearings. Get extra load capacity, longer bearing life and extra margin of safety for your equipment.

Available in a full range of standard sizes, fully interchangeable with other bearings in complete unit or component parts. Engineering service and stocks in all industrial centers.



End views of a "staggered" roller bearing (left) and a conventional bearing, show how many short rolls, instead of fewer long rolls, distribute the load over a multiplicity of contact points in the loaded zone. This also eliminates skewing tendencies of long rollers—provides closer centers for maximum supporting area—assures smooth, precision running.

Submit your problems to our engineering department. Write for Engineering Data Book.

ORANGE ROLLER BEARING CO., INC., 552 Main Street, Orange, N. J.

Specialists in AUTOMATIC MACHINES

SWANSON

TOOL & MACHINE PRODUCTS INC., ERIE, PA.

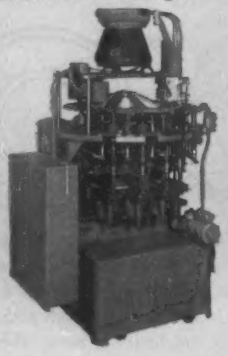
Since 1919

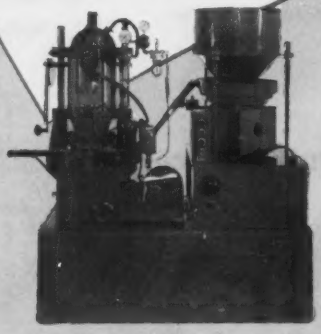
Swanson offers a fully integrated organization experienced in engineering and building special automatic machines for machining, processing and assembling small and medium parts. Illustrated are typical examples of Swanson special machines which are improving quality and lowering costs in a wide range of manufacturing operations. Because they incorporate Swanson-developed standard components wherever applicable, both time and money were saved in their completion.

If you have a problem in automation, tell us about it. We'd like to help.

Your inquiries will be treated in full confidence . . . our recommendations submitted without obligation.

Completely automatic turret type machine for processing four electronic parts simultaneously at each index. Equipped with hopper feed, automatic chucking, transfer mechanism, Swanson-designed memory device and automatic unloading.





An automatic straight-line indexing machine, designed for injecting cement into flash bulb bases. Machines of this type have increased previous production rates by three to five times.

This special machine for drilling, tapping, reaming and counterboring cigarette lighter parts at 1200 per hour, was designed and built around a standard 8-station Swanson Turret Indexing Unit.

SWANSON TOOL & MACHINE PRODUCTS, INC.

814 East 8th Street • Erie, Pa. • Phone 2-6763

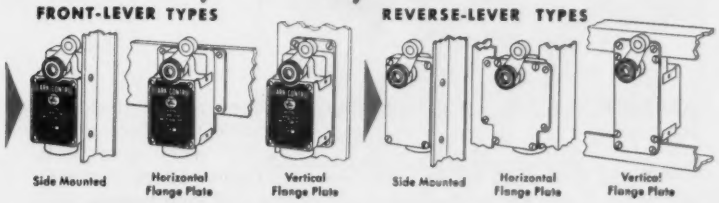
For more information on products advertised, use Inquiry Card, page 241

NEW!

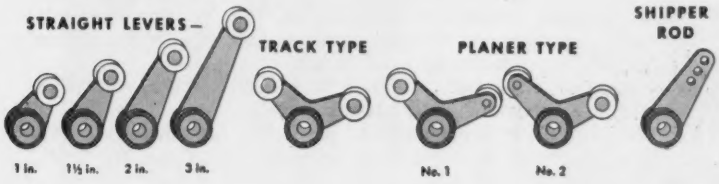
CLARK *Type DM* MACHINE LIMIT SWITCH

• This new heavy-duty limit switch is built with a minimum of moving parts, and with emphasis on simplicity of construction. The primary objective in its design is to provide dependable, accurate, trouble-free operation for a long life. All latch and trip-bearing surfaces are nylon to steel for minimum wear. All springs are in compression for greatest safety—they cannot be overloaded. This and other features make the switch as nearly fail-safe as possible.

Mounting Arrangements



Operating Levers



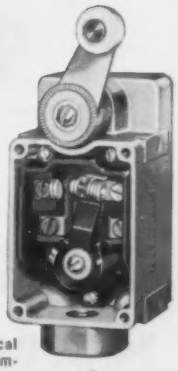
Nylon roller cushions impact, has low friction coefficient and long wearing qualities.

Reversible operating lever. Simple screw driver adjustment for reversing or positioning.

Heavy molded insulating chamber surrounds all live parts and provides ample wiring space for four No. 12 wires with Stakon connectors.

Areas subjected to arcing are protected by glass-melamine plates.

Electrical and mechanical sides of switch are completely isolated.



Nema Type 5 dust-tight, oil-tight enclosure of heavy die-cast construction.

Double-concentric overtravel springs in compression for fail-safe operation.

Return spring is in compression. Can be changed without tools to either side of arm, or removed for maintained contact.

Spring-loaded latches are nylon for low friction and long life.

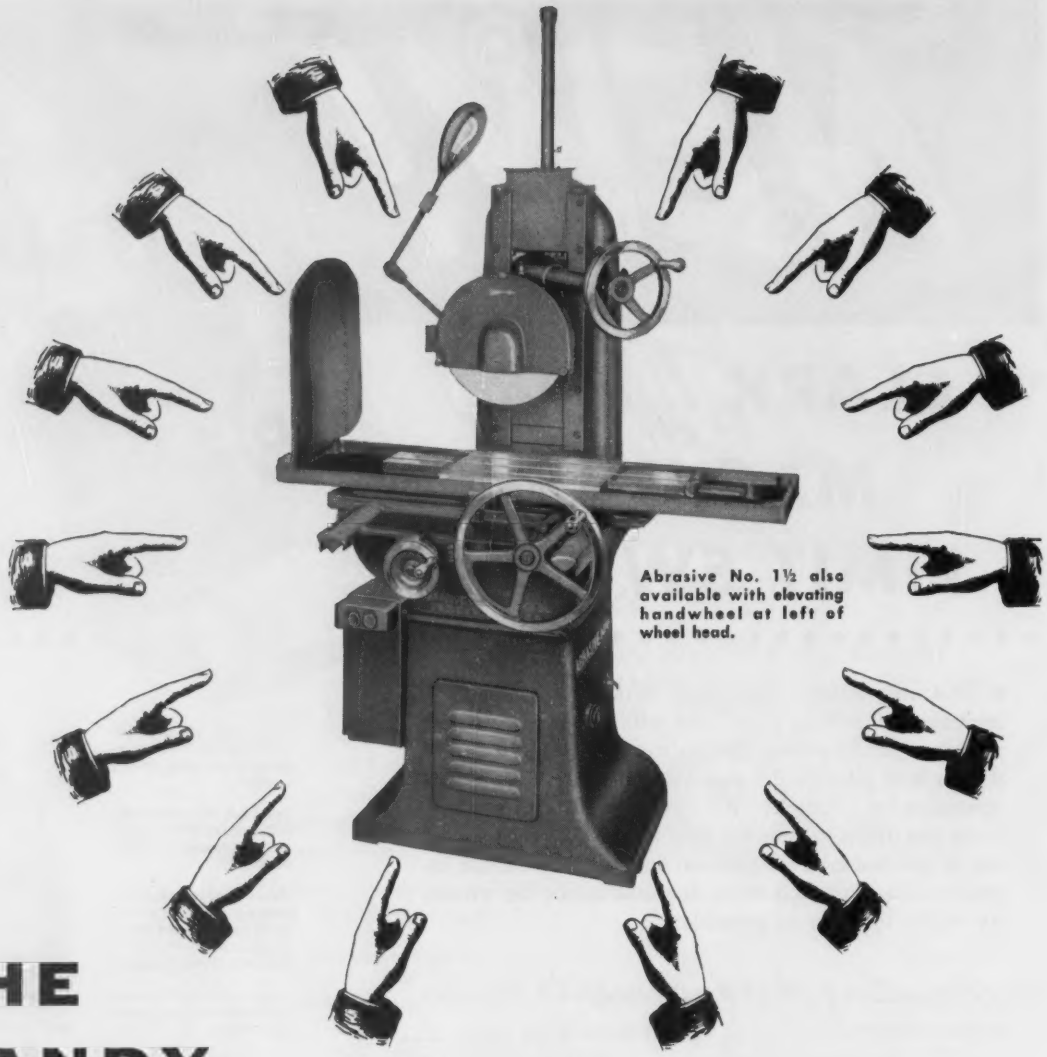
Choice of ½" or ¾" conduit opening.

Write for Bulletin 102DM

The **CLARK CONTROLLER** *Company*

Engineered Electrical Control

1146 East 152nd Street • • Cleveland 10, Ohio



Abrasive No. 1½ also available with elevating handwheel at left of wheel head.

THE HANDY SURFACE GRINDER

ABRASIVE No. 1½ is the hand feed toolroom grinder designed for maximum handiness. Handiness — to quickly produce different jobs regardless of size, with its 15" x 10" work table. And handiness that pays off in toolmaker popularity. Large convenient handwheels, for controlling depth of cut and longitudinal and crossfeed movements, make any precision grinding job a fast one on the Abrasive No. 1½.

The many one-of-a-kind jobs which can tie up your toolroom are easily handled by Abrasive No. 1½. Your proof of this grinder's versatility can be seen in the thousands of shops where this grinder is producing at least 25 jobs a day.

Standard equipment — 1 H.P. motorized spindle. Available with 2 H.P. spindle at slightly increased price.

For complete specifications, send for Abrasive No. 1½ Catalog. Abrasive Machine Tool Company, 12 Dunellen Road, East Providence 14, R. I.

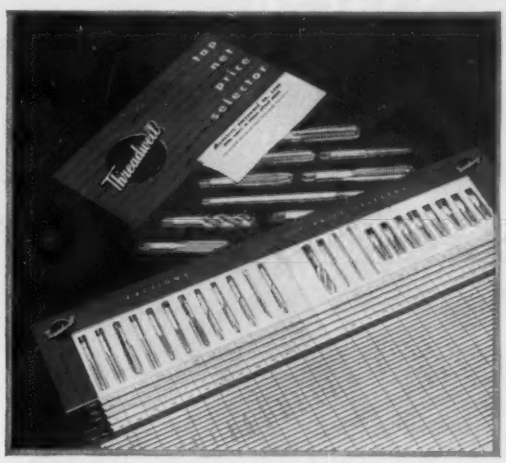
ABRASIVE
ACCURACY BOOSTS PRODUCTION

ABRASIVE QUALITY IS REFLECTED IN THE FINISH OF YOUR PRODUCT

For more information on products advertised, use Inquiry Card, page 241

selected for service

GAGE SELECTOR



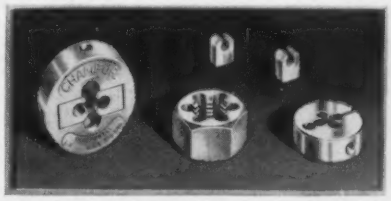
NET PRICE SELECTORS

For the convenience of cutting tool and fixed gage users and buyers Threadwell presents two more services for more efficient and economical production:

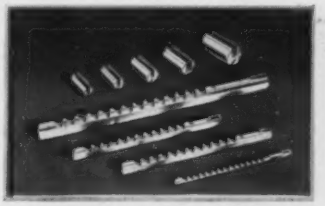
NEW THREAD GAGE SELECTOR—a complete pocket-size tabulation of basic data for thread plug and ring gages, both fractional and numbered sizes from No. 0 to 1½".

NEW NET PRICE SELECTORS—provide quick data on all standard taps, dies, tap and die kits, counterbores and keyway broaches; simply pick the size and style wanted and get the net price instantly.

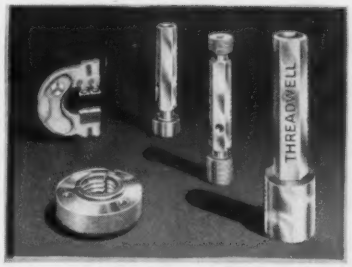
Ask your Threadwell distributor for these two new members of the Threadwell service family. Ask him too about the long service life of Threadwell's fine cutting tools and gages.



ADJUSTABLE ROUND, 2-PIECE & HEXAGON DIES



KEYWAY BROACHES & SETS



COMPLETE LINE OF HIGHEST PRECISION GAGES

THREADWELL DISTRIBUTORS, too, are strategically located to serve you promptly, properly, and well.

see your **Threadwell** distributor

THREADWELL TAP & DIE CO.
Greenfield, Mass., U. S. A.

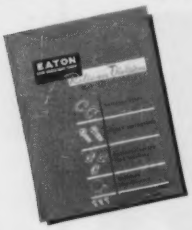
THE FINEST IN CUTTING TOOLS & GAGES

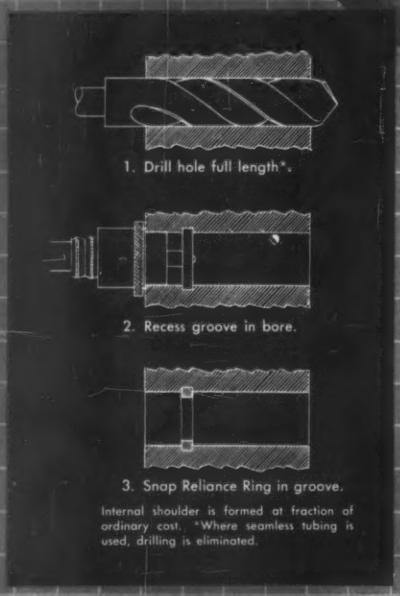
Reliance

SNAP RINGS Save Man Hours Money and Material

Now it's easy to position gears and bearings on shafts without resorting to countless hours of intricate and expensive machining operations. Nor do you sacrifice quality when you let Reliance Snap Rings do the same job on shaft assemblies, bearing applications and counterbores that formerly required many man hours and wasted materials.

Reliance Snap Rings form a solid shoulder able to withstand predetermined thrust loads simply by machining a groove into a shaft and snapping in a Reliance Ring. Compare this to the waste in time and materials of machining the entire length of the shaft to form a shoulder. Wherever it is practical from a design standpoint, Reliance engineers can show you how to save man hours, money and material by switching from expensive machining operations to Reliance Snap Rings. You will find more detailed information in our Engineering Folder 4K/3 which we will be happy to send at your request with no obligation.




1. Drill hole full length*.
2. Recess groove in bore.
3. Snap Reliance Ring in groove.
Internal shoulder is formed at fraction of ordinary cost. *Where seamless tubing is used, drilling is eliminated.

RELIANCE DIVISION EATON® MANUFACTURING COMPANY

Springtites & Sems · Snap & Retaining Rings · Special Steels · Spring Lock Washers · Hoz-Fas-Ner

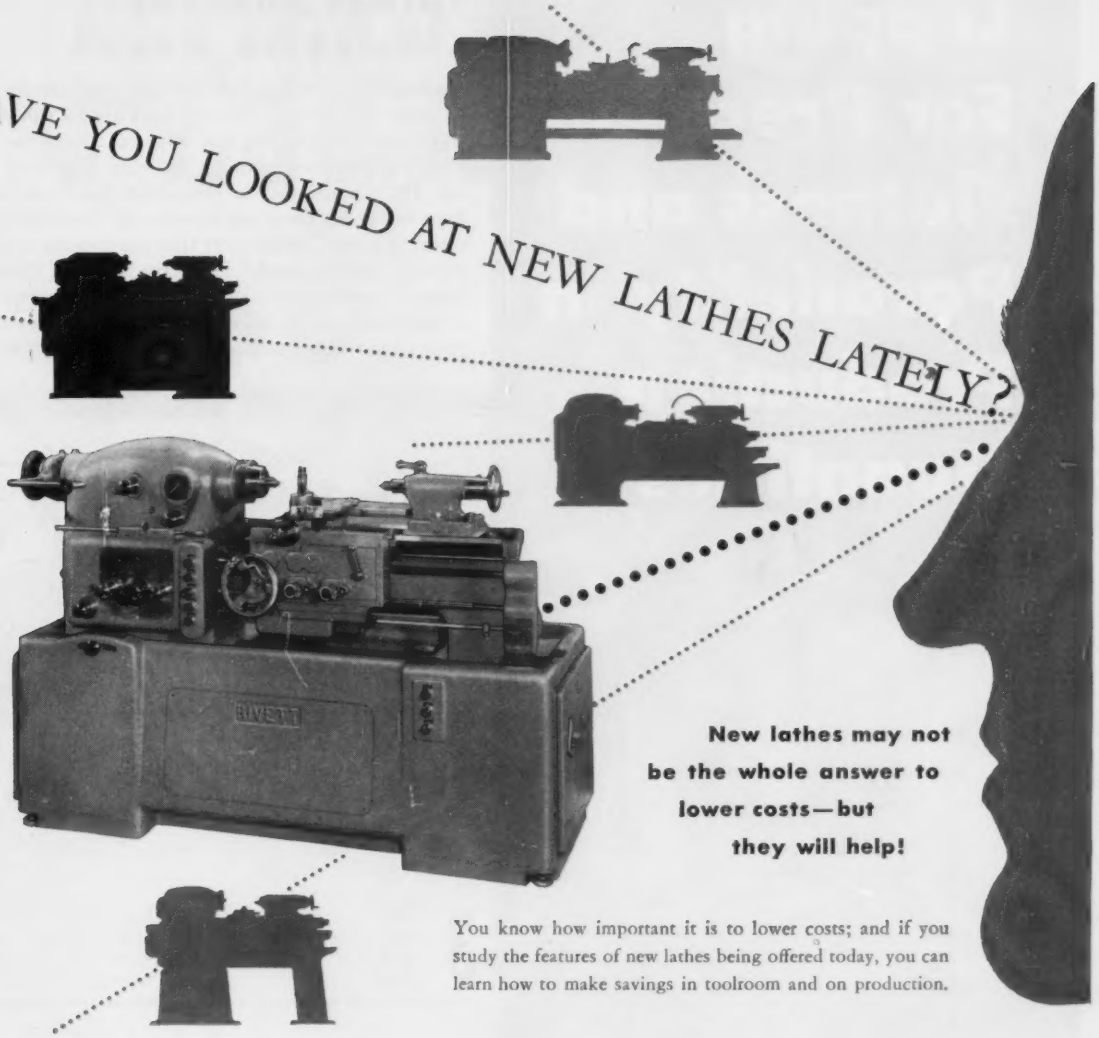
Office and plants: 507 Charles Ave., S.E., Massillon, Ohio

SALES OFFICES: New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal

"SPRINGTITE" AND "HOZ-FAS-NER" ARE REGISTERED TRADEMARKS OF THE EATON MANUFACTURING COMPANY

For more information on products advertised, use Inquiry Card, page 241

HAVE YOU LOOKED AT NEW LATHES LATELY?



New lathes may not be the whole answer to lower costs—but they will help!

You know how important it is to lower costs; and if you study the features of new lathes being offered today, you can learn how to make savings in toolroom and on production.

Rivett offers two lathes for one!

This observation is particularly true if you look at the new Rivett Model 1020S Precision Toolroom Lathe. It features sensitivity for turning tolerances within .0004″; and heavy biting ruggedness for a ¼″ cut at .020″ feed in cold rolled steel. In short, it is an instrument lathe and an engine lathe combined to handle any work within its 12½″ swing and 20″ centers.

26 Features Distinguish Rivett 1020S

The Rivett Model 1020S is head and shoulders above any ordinary lathe. Its design includes 26 individual qualities that substantiate Rivett's reputation for extreme precision and economical production.

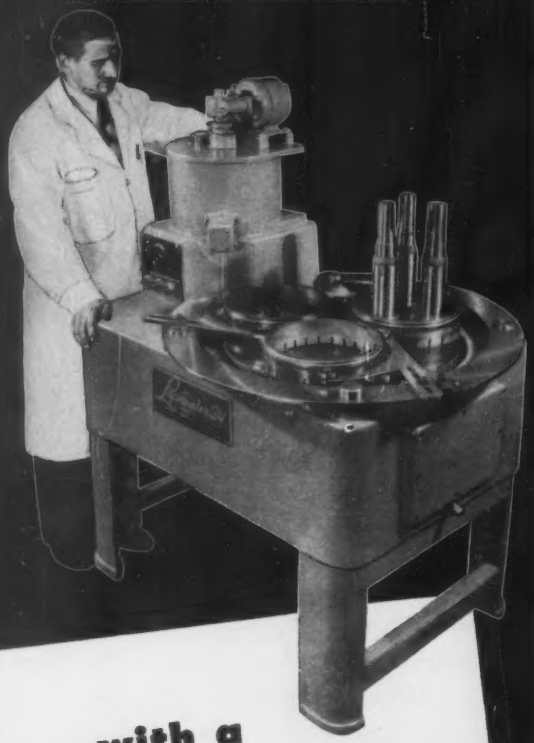
Write for free catalog

Why not write for the new Rivett Catalog 1020B and read these important 26 features—compare them with the designs of other makes of lathes—and thereby realize what a Rivett can do for your shop in the way of time and money (not to mention how happy it will make any *real* machinist to work with such *real* precision!)

RIVETT

RIVETT LATHE & GRINDER, INC., DEPT. MR-2 BRIGHTON 35, BOSTON, MASS.

Lapping For Precision Flatness and Parallelity in Production Quantities



...with a LAPMASTER

This is the machine for you if you want precision flatness in production quantities at low cost. Lapmasters readily lap to the extreme close tolerance of one light band (.0000116") or less. In addition they produce an extremely fine finish to as low as 1 RMS. They are available with 12", 24", 48", 72" or 84" lapping plates.

THIS IS HOW THE LAPMASTER WORKS

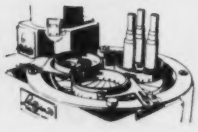
I, a heavy cast iron lap plate revolved slowly under power. **II,** large cast iron conditioning rings are held in position and rotate freely on the lap. **III,** work pieces are placed inside the conditioning ring where they also rotate on the lap. **IV,** a liquid vehicle containing fine loose abrasive flows on the lap plate and is uniformly distributed under the work pieces. At the same time the rotating conditioning rings preserve the flatness of the lap plate. These three essential features, combined with the rapid cutting action of loose abrasive produces a flatness which meets every production requirement.

1 Operator requires no previous lapping experience.

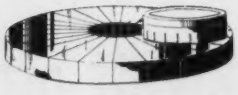
2 Lapping with loose abrasive and without excessive pressure eliminates heat and subsequent distortion.

3 Simplicity of design provides accessibility and allows ease of loading and unloading.

4 Loose abrasive distributed evenly over lapping area insured uniform results.



5 Precision laps identical parts in one cycle or parts of various shapes, heights and materials in one cycle.



6 Lap plate always kept in condition while in operation. No down time required for truing or reconditioning.

Learn more about the possibilities of production lapping and the interesting subject of measuring flatness. The illustrated fact-filled booklets are yours for the asking. Write today.

Protected by U.S. and Foreign Patents

CRANE PACKING COMPANY, Dept. M-2
1833 Cuyler Ave., Chicago 13, Ill.
In Canada: Crane Packing Company Ltd.
617 Parkdale Ave. N., Hamilton, Ont.

Lapmaster Division **CRANE PACKING COMPANY** 38 YEARS INDUSTRIAL PROGRESS

For more information on products advertised, use Inquiry Card, page 241

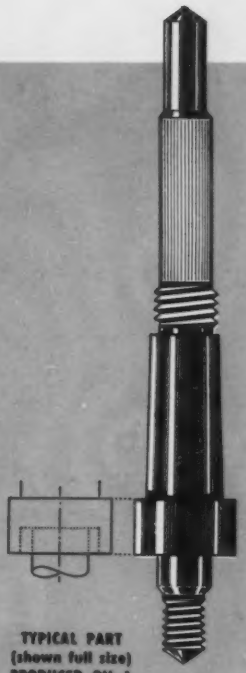
PETERMANN

AUTOMATICS

for close tolerances . . .

THIS NEWEST MEMBER OF THE *Petermann* FAMILY OFFERS NEW AND VALUABLE FEATURES SUCH AS:

1. Six (6) radial tools (all independently controlled).
2. Hydraulic buffer for shortening the time of return stroke.
3. Accelerator which speeds up the cam shaft during "idle time"
4. Speed box change for both spindle and cam shaft.
5. Automatic lubricating system.



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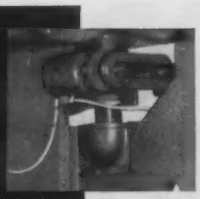

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A separate motor with micrometer control drives both ram adjustment screws. Direct reading indicators on each screw show vertical adjustment in thousandths. The range is 5"; out-of-parallel maximum adjustment is 2".

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Even the smaller Columbia Press Brakes illustrate a fine balance of ruggedness and efficiency which make for dependable, low-cost operation.

An outstanding feature for easy, accurate set-up and adjustment is the Motor-Operated Micrometer Ram Adjustment. At the touch of a button, either or both connecting screw nuts are rotated, adjusting ram position or parallelism with micrometer accuracy.

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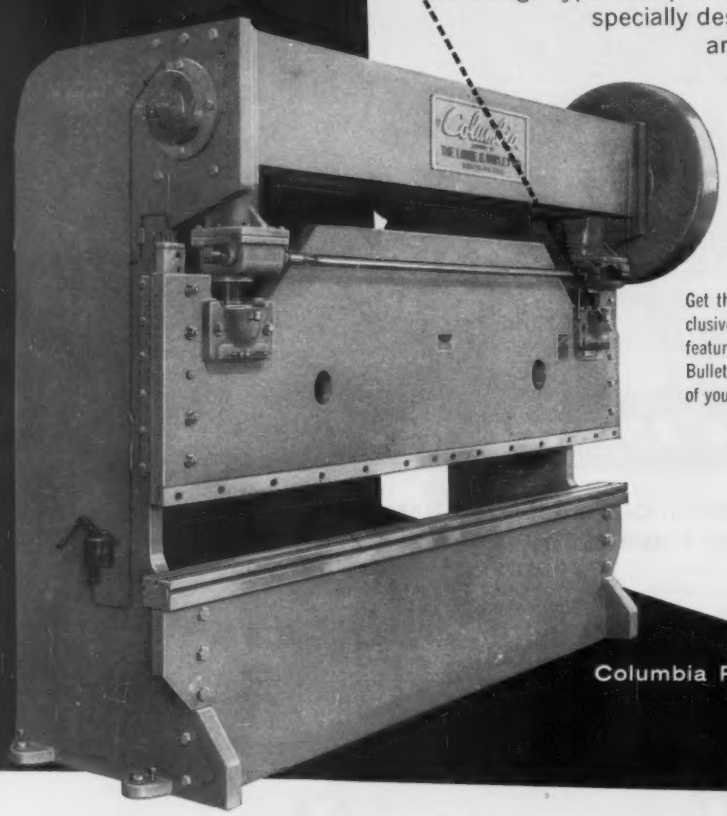

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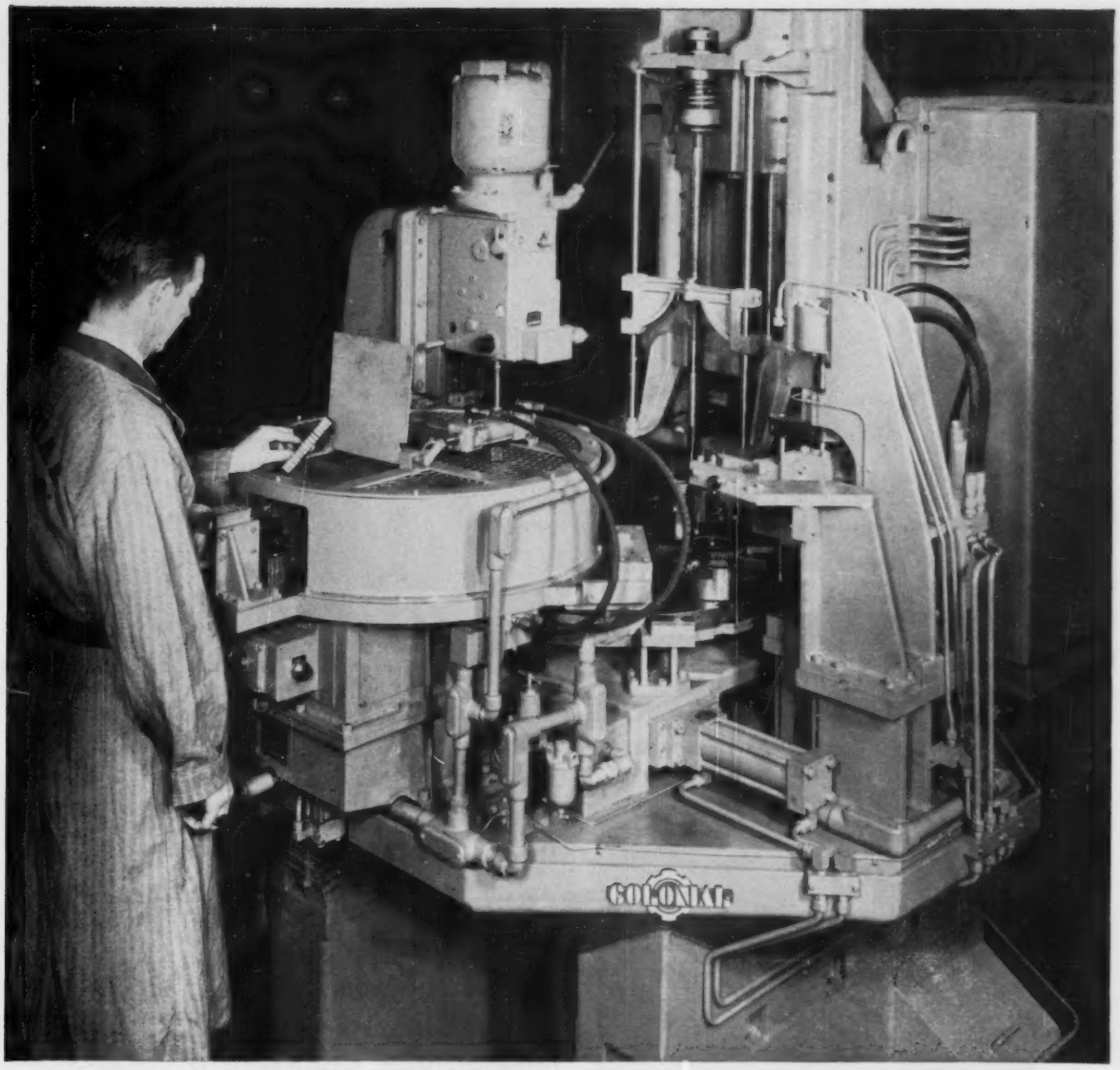

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Broaching-"Plus" is a new trend in broaching machines today. Integrating broaching into a machining sequence on a part, so that the operator has less work handling, cuts costs and speeds up processing.

Colonial Broaching-"Plus" machines can perform multiple operations on your parts. For information on how your costs can be cut, send your prints and production requirements to Colonial Broach Company's Engineering Department.

UNIFIED BROACHING is the key to successful broaching

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BROACH CO. DETROIT 13

RIFLE DRILLING machine in plant of O. F. Mossberg & Sons Company, New Haven, Connecticut. Stock is gun barrel steel, 25 inches long. Using *Texaco Sultex Cutting Oil A*, rate of feed is 6 inches per minute, with speeds up to 750 surface feet per minute. The company also uses *Texaco Sultex Cutting Oil A* in machining other steels, including aircraft alloys, with excellent results.

"We're getting as much as 75% LONGER LIFE from our deep hole drills"

—says Swan Esborn, Chief Engineer, O. F. Mossberg & Sons Co., New Haven, Connecticut

"**WHEN** you're drilling shotgun and rifle barrels," says Mr. Esborn, "it's important that tools stay sharp. Over the years we've tried various cutting fluids, but the one we prefer and use exclusively is *Texaco Sultex Cutting Oil A*. It gives us as much as 75% longer life between drill grinds and excellent finish. Our rate of feed is better than the average for the industry. Production is consistently high."

Benefits like these are the rule wherever Texaco is on the job. There is a complete line of *Texaco Cutting, Grinding and Soluble Oils*—and Texaco Lubrication Engineering Service to help you select the proper ones to do all your machining better, faster, and at lower cost.

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By LORING F. OVERMAN

New Defense Plans in Preparation

NINETEEN hundred fifty-five opened with Washington exploring another approach to the problem of keeping defense preparations current—at lower cost. When the Administration changed two years ago, Congress and the Pentagon officials talked about a "new look" defense program. This was a streamlined version intended to buy more defense for less money. Important savings followed, but after last fall's elections, Congress announced that it plans to take another look to make certain that federal defense budgets are not being trimmed at the risk of national safety. Possibly as a diversion, the Administration has announced a change of pace which may become known as the "long look." To introduce this new concept of defense preparations, the President has expressed the need to be constantly prepared for the next fifty years, or more, for instant action in case of hostilities.

Fewer Men in Armed Forces

The first step in the program, in an effort to obtain $2,000,000,000 for extremely important purposes, will be to cut 100,000 men from the armed forces. By June 30, according to the plan, the Army will lose 73,000 men; the Navy 17,000, and the Marines 10,000. The Air Force is not slated for personnel cuts. On the contrary, there is to be increasing emphasis on air power, particularly air transport.

Air Transport versus Stockpiles

The air transport program now receiving serious consideration in Washington calls for moving both supplies and personnel by air cargo fleets. While the program does not contemplate the movement of every piece of military equipment by this means, the extent of the program suggests important changes for many industries. With delivery time cut from weeks to hours, less matériel would be needed in the supply pipelines.

The cost of providing air fleets to handle such a program would be high initially, but the planners say that the over-all cost of a long-term defense program could be trimmed in many ways, with a net saving as the probable result. As explained by George T. Baker, Professor of Transportation, Harvard School of Business, the major savings of the new system lie outside the area of direct transportation and handling. Instead, savings would result (1) from a reduction of packaging and hauling items not wanted or needed, and (2) from better inventory control and less obsolescence.

New Budget Set Up by the Department of Defense

Despite changes in the budget of the Department of Defense, funds needed for fiscal 1956 will be approximately $34,500,000,000, according to Secretary Wilson. The new funds requested would be about $5,000,000,000 above 1955 appropriations. Reflecting the long-pull thinking, the Department of Defense is seeking authority to make long-term maintenance and storage contracts for machine tools. The proposal calls for further extension of Public Law 130, which gives authority to make contracts to maintain facilities and store tools that are a part of the National Industrial Reserve, or the mobilization base. The law will expire June 30. The Department of Defense seeks authority to make twenty-year contracts to maintain facilities which are considered a part of the mobilization base. It also asks permission to make contracts to store machine tools for as long as twenty years at a contracting plant or near the site of the plant which would use the tools in the event of all-out mobilization. At present, such contracts are usually from year to year; in any event, for no more than five years.

Preferential Planning List Approved

Machinery builders who are either working on defense contracts, or intending to bid on them in the event of need, will be interested in two new lists which have just been approved by the Armed Services in conjunction with the Production Allocation Plan. One is a preferential planning list which names critical and important items needed in time of war. The other is an alphabetical register of planned wartime matériel suppliers. Both lists are classified, but any properly identified official of a firm listed in the register may be shown an entry or entries pertaining to his own organization.

A firm desiring to be listed in the register, or to determine whether it is now listed, should communicate with the office that purchases the military items which the company now makes, or could make if needed. This information is available in two booklets obtainable from the Central Military Procurement Information Office, Pentagon Building, Washington, D. C. The titles are "Purchased Items and Purchasing Locations of the Department of Defense," and "How to Sell to the Department of Defense." After consulting these booklets, a firm should bring to the attention of the appropriate military offices, its ability to produce the specific equipment listed.

Washington Briefs

Clark Heads GIED—Everett C. Clark, Birmingham, Mich., has been named chief of the General Industrial Equipment Division of the Business and Defense Services Administration. Mr. Clark is on loan from the Sperry Corporation, being manager of industrial products sales for Vickers, Inc., a Sperry division.

Progress in Metals Identification—Rapid progress is being made toward completion of a new standard identification marking system for metal shapes and forms by the Armed Services. The program is expected to cover both ferrous and non-ferrous products used in military applications.

Small-Business Policy Announced—A new statement by the Department of Defense covering its policy regarding small business has been announced. As outlined in Directive No. 4100.10, this policy is designed to assure small business concerns an equitable opportunity to compete for prime contracts, both advertised and negotiated. Procurement officials are directed, in so far as it is practicable "to solicit bids or proposals from all business concerns on the mailing lists, or, where the entire list is not being solicited, from established or potential small business concerns in a pro rata proportion."

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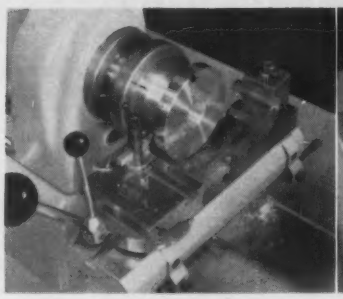
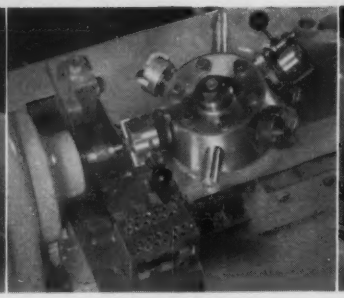
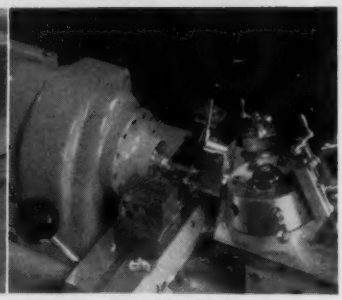
NEW Variable Speed Machine for PRODUCTION DEPARTMENTS



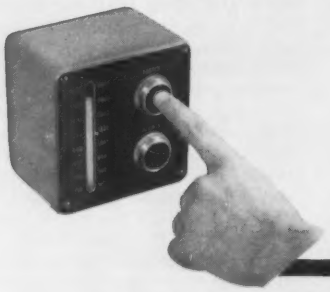
Large Work



Threading



Small Work



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MACHINERY
FEBRUARY 1955

Ingenuity Keeps Our Industry in the Forefront

THE vigor of American industry is due in large measure to its progressive outlook with respect to the development of new products and manufacturing methods that seemingly border on the fantastic until their practicability has been proved. During the last several years besides automation there have been many other noteworthy advances in methods of making our multitudinous products.

Anyone connected with the field of metalworking knows that carbides are the hardest material made by man for commercial use, but who would ever have dreamed that carbides could be ground by brass wheels without the use of any abrasive! Yet this is being done by one shop to obtain irregular contours on cutters. The secret of the process is that brass wheels having an outline that is converse to the shape required on the carbide tool, serve as electrodes through which a high-frequency electric arc is discharged to erode the carbide. The work, submerged in a dielectric coolant, is connected to the positive terminal of a power supply unit. High finishes can be obtained on the carbide tools at a substantial rate of stock removal.

There has been an important trend in recent years toward the production of equipment that necessitates less removal of chips during machining operations. Shell-mold casting is such a process. Molten metal is poured into thin, plastic-bonded molds to produce castings accurate in detail that require a minimum of cleaning and machining.

Impact or "mid-air" forging is another important development in which the stock is positioned between dies mounted on reciprocating impellers that are driven together in a horizontal plane by compressed air. Shock and vibration are practically eliminated.

Involute splines, oil-grooves, and serrations can now be cold-rolled externally within an accuracy of 0.0008 inch and to a surface finish of 3 to 5 micro-inches r.m.s. by means of a recently developed hydraulically actuated machine. Splines may be formed right up to a square shoulder.

Another development of the past year comprises a revolutionary application of the age-old art of metal spinning. Intricate shapes can be formed with thinning or thickening of the metal in prescribed locations and dimensions can be held to plus or minus 0.002 inch. Sheets as thick as 1/2 inch are being handled by the heavy-duty lathes. This process has been successfully applied on the various high-strength heat-resistant alloys used in jet-engine construction, as well as on copper, aluminum, and mild steel.

Mention should also be made of the striking advances in the development of scientific equipment for detecting flaws below the surface of metal parts and for determining surface roughness. There is an ultrasonic Reflectoscope which not only determines the existence, direction, and location of flaws, but also measures thickness and studies such physical properties as elasticity, porosity, and grain size. This instrument is being applied in a great number of shop operations, and for such field work as checking the hull plates of ships for thickness and the tracks of large railway systems for defects.

Such are the time-saving and quality-increasing machinery and tools that are constantly being produced by engineers of machine building and machine using companies. As we look forward to the possible manufacturing developments in the years immediately ahead, the horizon is unlimited.

Charles O. Herb

EDITOR

What's New in Steel Service

Again in 1955, as in every year since 1842, Ryerson is setting the steel-service pace. Many advances in our ability to serve you have been made in recent months—many more are immediately ahead. Briefly, here is what you can expect:

EXPANDED STOCKS—Amazing new leaded alloys in three carbon ranges—carbon steel plates produced to an "easy-welding and forming" specification—304L and 316L stainless plates and sheets for superior welding characteristics—type 430 stainless sheets for those who want an alternate to higher priced 18-8 stainless. These are a few recent additions and further stock expansion is already under way.

NEW QUALITY SAFEGUARDS—Steel you order from Ryerson now protected by a whole new set of quality control standards—tighter than any thought possible before. As evidence of uniform high quality we can furnish a certificate of analysis or a mechanical properties report for every pound of steel we ship.

STEPPED-UP SERVICE—On 92 to 98% of the regular orders we receive, steel is cut and shipped the same or following day. With two new plants getting into operation, and with facilities enlarged and modernized from coast to coast, we'll do even better in the weeks ahead.

So here's our steel-service pledge to you—an even wider selection of steels, dependable high quality, delivery where you want it—when you want it—now and throughout 1955.

RYERSON STEEL

In stock: Bars, structurals, plates, sheets, tubing, alloys, stainless, reinforcing, machinery & tools, etc.

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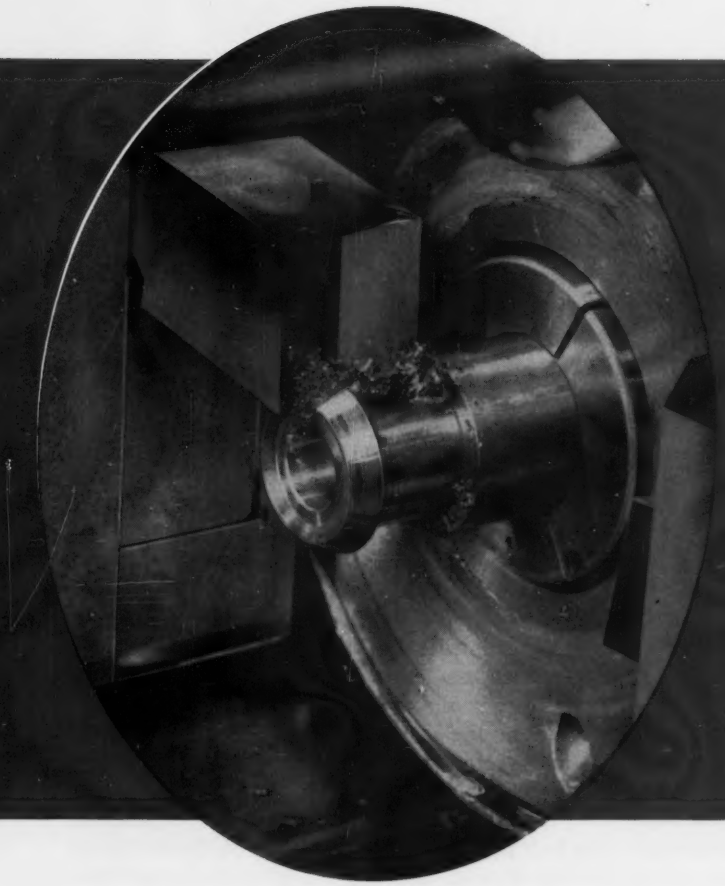


SKIVING TOOLS

Hold Gear Blank Tolerances to Two "Tenths"

Cutting tangentially and independently of a mechanical stop, the skiving tool affords inherent sizing control. Now, simple formulas eliminate the difficulties in compounding the tool contour

By WALTER JELLIG, Chief Tool Engineer, and
WARREN VETTER, Design Leader

Ford Instrument Co.
Division of the Sperry Corporation

GEAR blanks meeting dimensional tolerances as small as 0.0002 inch are obtained as a regular part of single-spindle automatic screw machine production at the Ford Instrument Co., Division of the Sperry Corporation, Long Island City, N. Y. Such extreme accuracy, necessary for the precision instruments made by the company, is held without difficulty by incorporating a skiving tool in the machining set-up.

In skiving, a tool having a matrix of the required contour ground into its length is presented to the work tangentially. This relationship is illustrated by the tool and gear blank in Fig. 1. A mild point on the nose of the tool divides it into two cutting edges, each of which is referred to as being at a skive angle. Since at any moment in the feed stroke only a small portion of each edge is actually engaged in removing a chip, cutting pressures are at a minimum. The tangential position of the tool permits the nose to pass beyond the vertical center of the work so that all cutting action can be completed.

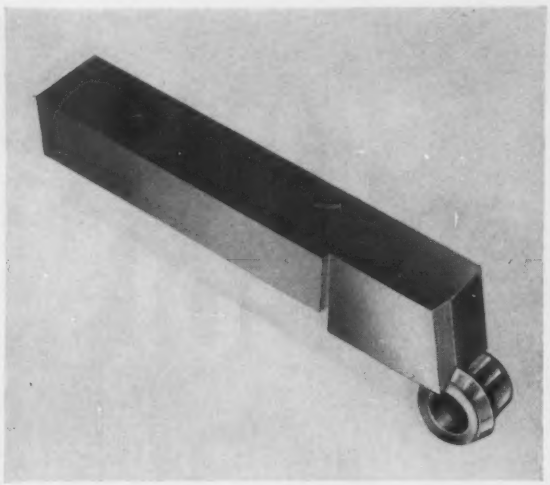


Fig. 1. The skive angles of the nose give the tool a favorable shear-cutting action and minimise cutting pressures.

A certain similarity exists between a skiving and a forming tool, in that the matrix of the required contour is ground integrally in both. But since the forming tool operates radially, the accuracy of the work diameters depends entirely on the accuracy of the feed stroke limit. Obviously, a 0.0002-inch tolerance cannot consistently be held by the mechanical slide stop of a screw machine. Also, the necessarily square nose of the forming tool, with its full cutting edge engaged in removing a chip, may impose tolerance-destroying pressures on the part and undesirable stresses on the spindle, cross-slide, cams, rocker arms, and other components of the machine.

Forming tools are generally easy to produce, since the dimensions of the matrix are taken directly from the part drawing. Ford Instrument uses them successfully in finishing contours on which tolerances are 0.001 inch, or greater. Skiving tools present a more difficult problem. The skive angles, the clearance angle, and the back rake of the tool all enter into the compounding of the dimensions of the matrix. These angles (5-degree skive, 8-degree clearance, and 2-degree back rake) are shown on the orthographic projection of a skiving tool, Fig. 2.

The company has obtained optimum results with these angles in skiving various sizes of gear blanks and other parts made of steel and nonferrous metals. There is also a tilt of the tool of 0 to 20 degrees from vertical to provide clearance along the rear side, which is in contact with the work. However, the tilt is disregarded in the usual calculations, except for the portion of the tool that must skive a straight diameter, such as the hub part of a gear blank. Here, the tilt must be considered, because an uncompensated tool can produce a taper of as much as 0.0016-inch in a 1-inch work length which is negligible on

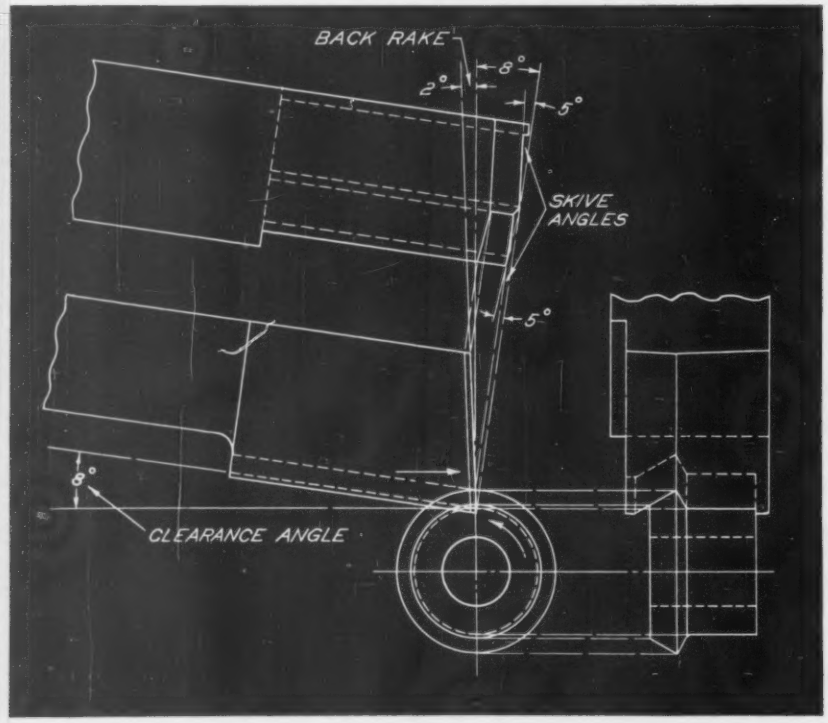
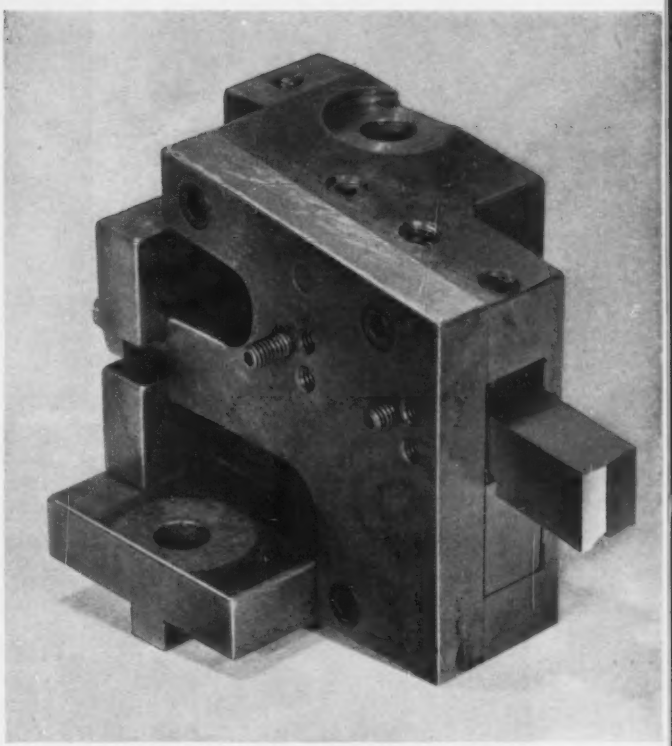


Fig. 2. The constants given in the formulas apply to skiving tools with the basic angles seen in this projection drawing.

Fig. 3. Toolpost construction has been standardized to support the tool at an 8-degree clearance angle.



bevel gear faces, but near specified limits on straight diameters.

To simplify the design, set-up, and resharpening of skiving tools, the toolposts used are of standard construction, supporting the tool body at the 8-degree clearance angle. A front toolpost with a tool in position is shown in Fig. 3. Rear toolposts, preferred for certain set-ups, are similar in construction.

In Fig. 4 is shown a close-up view taken over the rear of the bed of a Brown & Sharpe No. 2G single-spindle automatic in the company's screw machine department. Precision gear blanks are being produced in this operation from 1-inch stainless-steel rod. In the cycle, tools held in the turret spot-drill, drill, bore, and ream the hole; cup (recess) the face of the gear; and internally chamfer the hub end. A conventional forming tool mounted on the rear cross-slide roughs out the external contour of the blank to within a few thousandths of an inch of finished size. This tool operates simultaneously with the drill in the turret.

Skiving follows, the tool being supported on the front cross-slide and operating in conjunction with the reamer. Upon retraction of the front cross-slide — the illustration shows this moment in the cycle — a cut-off tool carried on an overhead slide descends and severs the blank. A spindle speed of 525 R.P.M. is maintained, except for the combined skiving and reaming operations, which are performed at 110 R.P.M. Cycle time for the job is two minutes.

Admittedly, the skiving principle is not new. Yet, because of the seemingly involved computa-

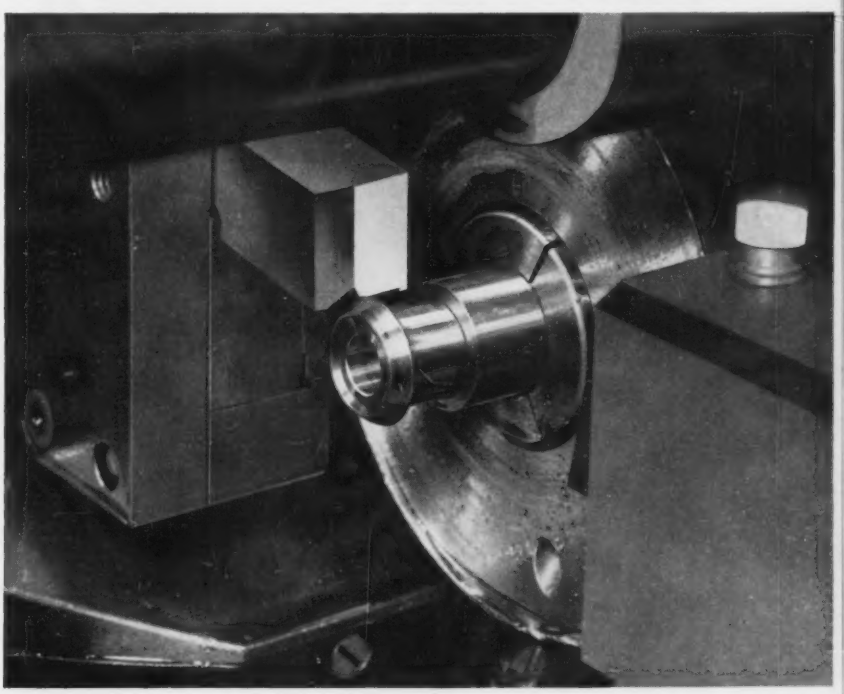


Fig. 4. Supported on the front slide of the machine, the skiving tool removes the final 0.005 inch of stock from the work.

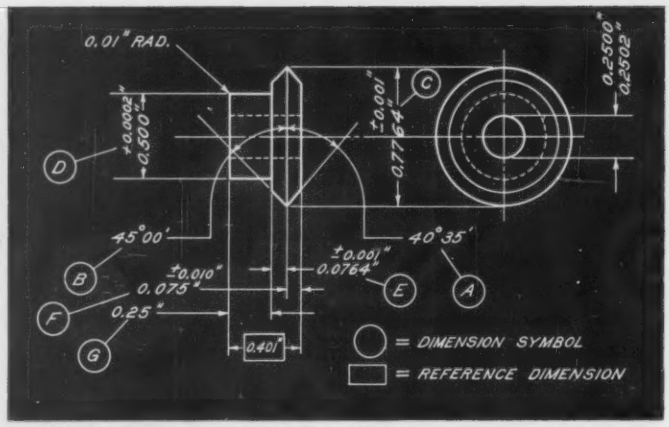


Fig. 5. (Right) The information necessary in calculating the tool contour comes from the dimensions on the part drawing.

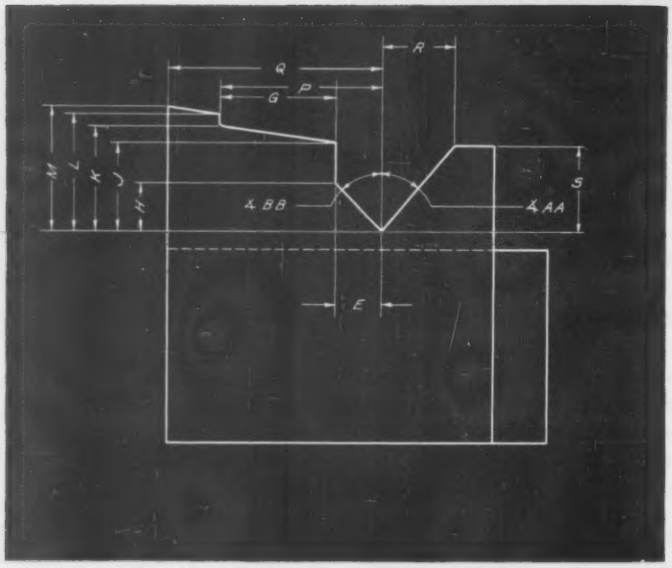


Fig. 6. (Left) This sketch shows the contour to be established in the plane of the tool.

tions in compounding the angles of the tool, many companies will finish the contour of a precision gear blank by some other means, such as by a secondary bench lathe operation or by shaving. (Shaving employs a tangentially operating square-nosed forming tool. The tool is easy to produce, since matrix dimensions are taken directly from the part drawing. It shares the advantage of the skiving tool in not being controlled by a mechanical stop in the cross-slide of the machine. However, pressures built up by the blunt nose shape rob the shaving tool of the extreme accuracies possible with the skiving tool.)

Calculating the Contour of the Skiving Tool

Actually, establishing the contour of the skiving tool boils down to some simple trigonometric calculations. And because Ford Instrument has standardized the skive angles, clearance angle, and back rake, the constants involved are universally applicable, no matter how complex the contour. Calculating the skiving tool contour for a typical gear blank will illustrate the procedure. A production drawing of the part appears in Fig. 5.

As an initial step, dimension symbols are added to the drawing, as indicated. Then, as in Fig. 6, a sketch is made of the contour, approximately as it would appear in the plane of the tool body. Dimensions *E* and *G* are taken directly from the part drawing (Fig. 5). These dimensions do not change. Since the blank will be severed at the left end of *P*, *Q* is greater than *P* by an amount slightly less than the width of the cut-off tool. Dimension *R* will be equal to *F* (Fig. 5) plus a small over-run, about 0.04 inch.

The following calculations are based upon the company's tool design standards — 5-degree skive angles, 8-degree clearance angle, and 2-degree back rake. These standards were adopted after extensive experimentation, and are recommended as proving highly successful.

Calculation 1. Find angle AA.

Angle AA is the corrected angle A in the plane of the tool. Angle A = 40 degrees 35 minutes (see Fig. 5).

$$\text{Tan } AA = \left[\frac{\tan A}{1 + 0.01236393 \tan A}\right] \quad 1.0148079$$

$$\text{Tan } AA = \left[\frac{0.856599}{1 + (0.01236393 \times 0.856599)}\right] \quad 1.0148079$$

$$\text{Tan } AA = 0.84762192 \times 1.0148079$$

$$\text{Tan } AA = 0.86017342$$

Angle AA = 40 degrees 42 minutes 4 seconds

Calculation 2. Find angle BB.

Angle BB is the corrected angle B in the plane of the tool. Angle B = 45 degrees 00 minutes (see Fig. 5).

$$\text{Tan } BB = \left[\frac{\tan B}{1 + 0.01236393 \tan B}\right] \quad 1.0148079$$

$$\text{Tan } BB = \left[\frac{1}{1 + (0.01236393 \times 1)}\right] \quad 1.0148079$$

$$\text{Tan } BB = 0.987787 \times 1.0148079$$

$$\text{Tan } BB = 1.00241405$$

Angle BB = 45 degrees 4 minutes 9 seconds

Calculation 3. Find dimension H.

Obtain E from Fig. 5.

$$H = \frac{E}{\tan BB}$$

$$H = \frac{0.0764}{1.00241405} = 0.076216 \text{ inch}$$

Calculation 4. Find dimension J.

Obtain C, D, and E from Fig. 5.

$$J = \left[\frac{\frac{C - D}{2} + 0.01236393\,E}{0.999391}\right] \quad 0.984808$$

$$J = \left[\frac{\frac{0.7764 - 0.5}{2} + (0.01236393 \times 0.0764)}{0.999391}\right] \quad 0.984808$$

$$J = 0.1392293 \times 0.984808$$

$$J = 0.13711413 \text{ inch}$$

Calculation 5. Find dimension K.

Obtain P and E from Fig. 5.

$$K = J + (P - E)\,(0.011346)$$

$$K = 0.137114 + (0.25 \times 0.011346)$$

$$K = 0.1399505 \text{ inch}$$

Calculation 6. Find dimension L.

$$L = K + 0.02$$

$$L = 0.1399505 + 0.02 = 0.1599505 \text{ inch}$$

Calculation 7. Find dimension M.

Assume a cut-off tool width of 0.05 inch, and also that Q is made equal to $(P + 0.05)$, instead of being somewhat less.

$$M = (Q - P)\,(0.011346) + L$$

$$M = (0.05 \times 0.011346) + 0.1599505$$

$$M = 0.1605178 \text{ inch}$$

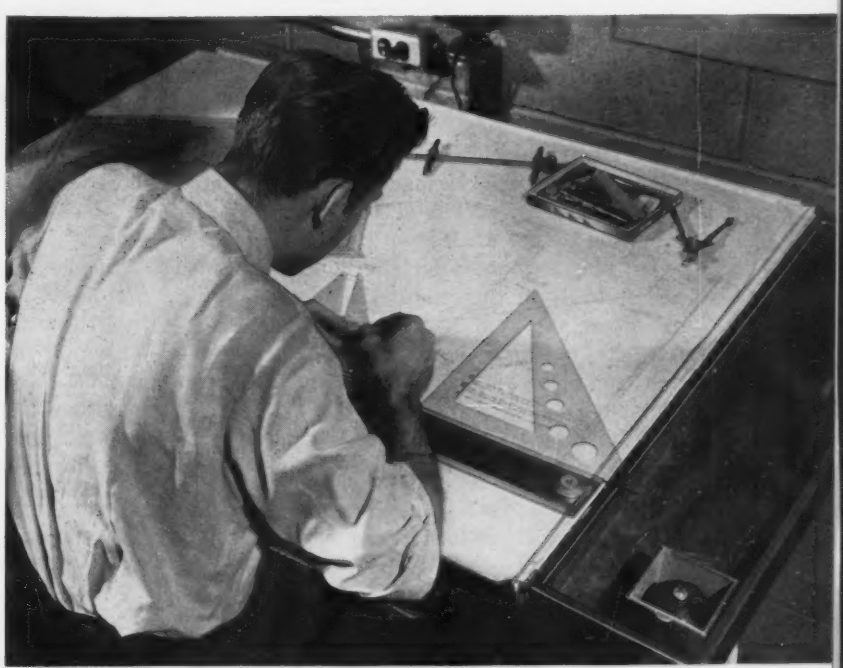


Fig. 7. A 50-to-1 scale lay-out is prepared on a vinyl plastic sheet from the sketch of the skiving tool.

Fig. 8. The operator moves the wheel-head in coordinate directions to keep the cross hairs in the scope over the lines of the lay-out.

Calculation 8. Find dimension *S*.

Assume an over-run of 0.04 inch; *R* equals (*F* + over-run).

$$S = \frac{R}{\tan AA}$$

$$S = \frac{0.075 + 0.04}{0.86017342}$$

$$S = 0.133694 \text{ inch}$$

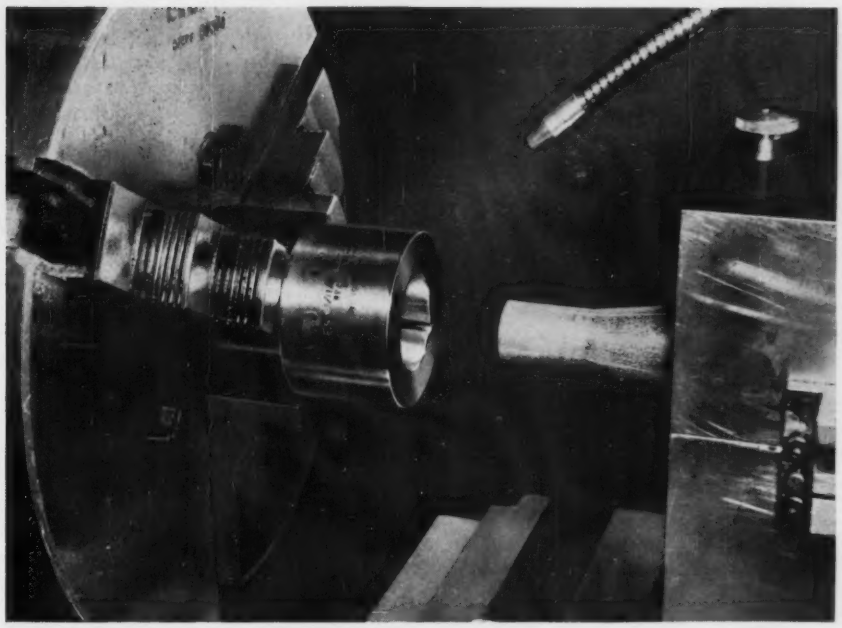
Grinding the Tool from the Lay-Out

With the calculations completed, an accurate 50-to-1 scale lay-out is made from the sketch illustrated in Fig. 6. The sketch itself is being constructed by the draftsman in Fig. 7. A sheet of vinyl plastic is used for the lay-out, because of the stability of this material under changing temperature and humidity. Given the part drawing, it takes one man about six hours to make the sketch, complete all calculations, and construct the lay-out.

The finishing of the skiving tool contour is performed directly from the lay-out on a Sheffield Micro-Form grinder, seen in Fig. 8. In preparatory steps, the tool has been rough-milled to the approximate contour and heat-treated; and the shank ground square to the standard size of the toolpost. The lay-out is then fastened to the drawing table of the grinder. An integral pantograph operates over the table.

A stylus in the long end of the arm of the pantograph is made to follow the lines in the lay-out. On the short end of the arm is a 30× scope. Cross hairs in the scope intersect at a point corresponding to the location of the stylus over the lay-out. The skiving tool is held vertically in a fixed position on a work-table, which is adjusted to the proper relationship with the grinding wheel.

In the operation, the wheel reciprocates up and down along the axis of the tool, and is fed into the work by manipulating coordinate slides on which the wheel-head is mounted. The work can be checked in position on the machine by moving the stylus from point to point on the lay-out and observing the intersection of the cross hairs in the scope.



Swaging Simplifies the Reduction of Tubing

Only a turret lathe and an inexpensive die are required to produce either simple or complex reductions on thin-wall aircraft tubing. Reductions to approximately 35 per cent of the original diameter have been successfully completed.

By RICHARD SIPE, Tool Engineer
Boeing Airplane Co., Seattle, Wash.

MANY miles of aluminum tubing form the arteries and veins of our present-day aircraft. Through these tubular life lines course the fluids necessary to perform the complex functions associated with the many facets of flying as we know it today.

At many points in this intricate network, it is required that a length of tubing be reduced in diameter at one or both ends. Because of the limited production runs of any one part destined for use on large aircraft, the expensive tooling usually employed on mass production lines must be avoided. Research has been conducted by the Boeing Airplane Co., Seattle, Wash., in an effort to design simple tools to accomplish the desired result.

The procedure currently being used, which is a variation of the common spinning method, employs a swaging action. Forcing a tube into the orifice of a rotating die causes a reduction of the original tube diameter. A turret lathe set-up for the operation is shown in the heading illustration. The tubing is clamped in a special fixture while a button die is held firmly between the jaws of a chuck.

The button die, which is machined from a solid steel bar with a high chromium content, is designed with an internal taper blending into a short straight section. Three grooves are slotted within the die opening, Fig. 1, to channel lubricant along the entire work area. The area adjacent to each groove is relieved to such a degree that it will not contact the surface of the work. In this way, approximately one-third of the tube circumference will be in contact with the forming area of the die bore.

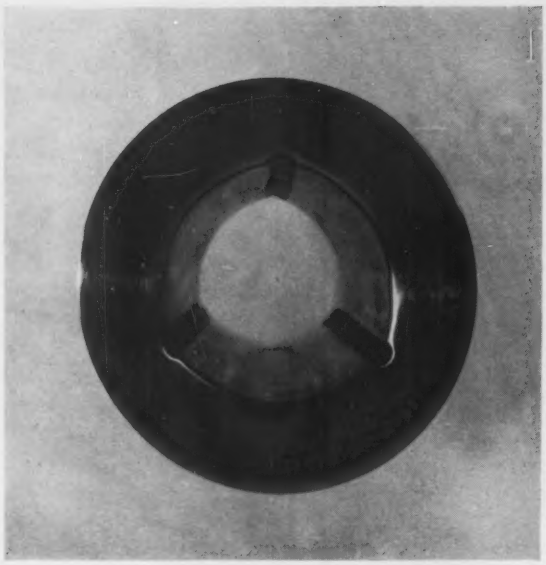


Fig. 1. Button die used for reducing aluminum tubing is of simple design. Three grooves allow lubricant to reach all parts of the tube surface.

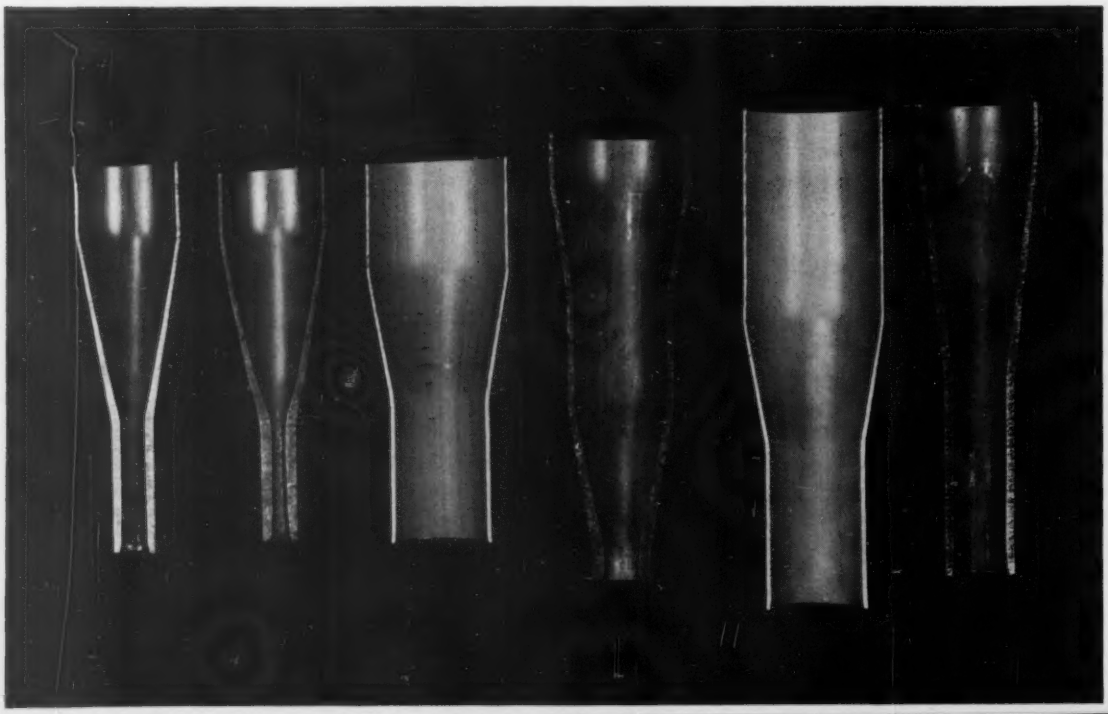
Then with the die rotating at a speed ranging from 300 to 400 R.P.M., the end of the tubing is advanced to the orifice. Reduction starts as the tubing enters the die. Forcing the metal into the die under pressure compels it to flow into the three relieved areas. Since there are alternate cavities and surface contact areas, the rotation of the die forces the contact areas to "bump," or swage, the ridges formed by the cavities into a circular reduced tube section.

Button dies can also be used to control the wall thickness of the reduced tube diameter. Unlike reduction by drawing methods where the thickness of the tubing wall is reduced, this swaging operation actually thickens the wall of the smaller diameter. Typical examples of various forms of reductions may be seen in Fig. 2. Clearly shown are the gradual thickening of the tubing walls on the tapered portion and the uniformly thick walls of the reduced straight portion of the smaller diameter. Little or no twist is imparted to the work.

The wall thickness produced in the work-piece is directly related to the radius used to connect the intersection of the tapered and straight portions of the button die. Thus, by controlling the amount of this radius, the wall thickness is also controlled. With the proper radius, wall thicknesses of up to 180 per cent of the original thickness may be obtained. Increased wall thicknesses are advantageous for applications in which threads must be cut for attachment to fittings. In many cases, controlled wall thicknesses also save secondary machining operations.

A case in which severe reduction was satisfactorily accomplished is shown in Fig. 3. The original diameter of 2.00 inches has been reduced to a diameter of 0.76 inch with no trouble. This represents a reduction of approximately 62 per cent. Double swaging also poses no problem. The length of tubing shown in Fig. 4 has had both ends reduced by merely forming one end, revers-

Fig. 2. Tube reduction by the button-die method results in a thickening of the small-diameter walls. The gradual increase in wall section is readily noticeable.



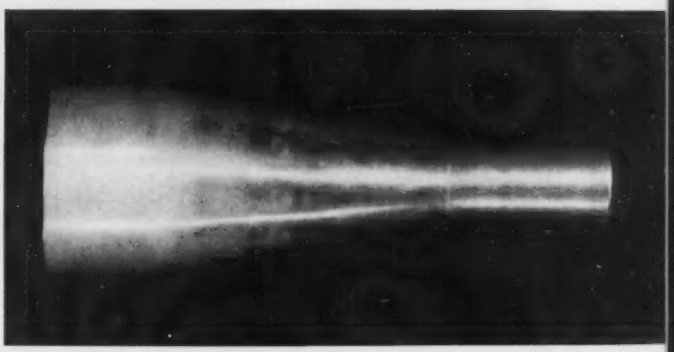
ing the work in the holding fixture, and repeating the operation on the opposite end.

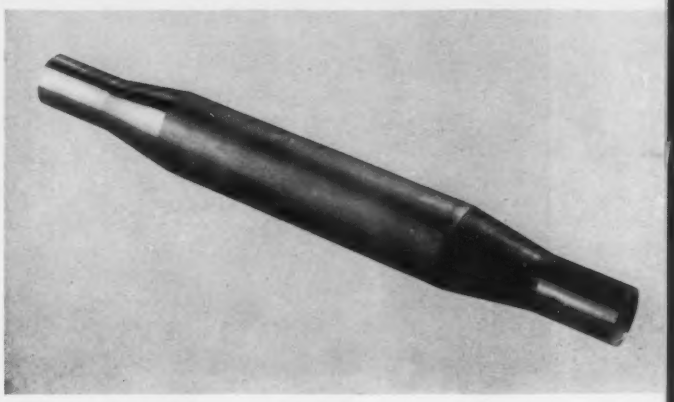
The type of die employed for the preceding operations may be used to reduce most alloys of aluminum tubing up to 3 1/2 inches in diameter and with a wall thickness up to 0.125 inch. Length of reduced diameter is not a limiting factor, since any length—up to and including the entire tube—may be reduced by this method. If care is exercised in tool manufacture, with emphasis on die finish, it is possible to form severe reductions with no trace of surface scoring or even removal of an anodized coating. This system of reduction is especially applicable in the aircraft industry because most aircraft tubing is aluminum and may be formed with relatively low pressure.

Button dies are comparatively inexpensive. The approximate time required to construct one is about twenty-five hours. When it is realized that an average of 5000 parts can be worked in one die without replacement, the advantages of such simple and economical tooling becomes obvious.

Although 50 per cent reduction is considered a practical average for a single pass, it has been possible to achieve as much as a 65 per cent reduction in one pass without resorting to annealing. This is shown graphically in Fig. 5. Various sizes of 2024-0 (24S-0) aluminum tubing, ranging from 2 inches down to 1 inch in outside diameter, were tested.

The initial wall thicknesses were 0.049 and 0.065 inch. As may be seen in the graph, the 0.049-inch thick wall tubing was reduced in diameter by 65 per cent. This operation resulted in an increase in wall thickness at the smaller diameter of 184 per cent. On the other hand, the 0.065-inch thick wall tubing was reduced in diameter by only 62 per cent, resulting in a wall thickness increase of only 174 per cent. By employing an intermediate annealing operation, these reductions may be further extended.





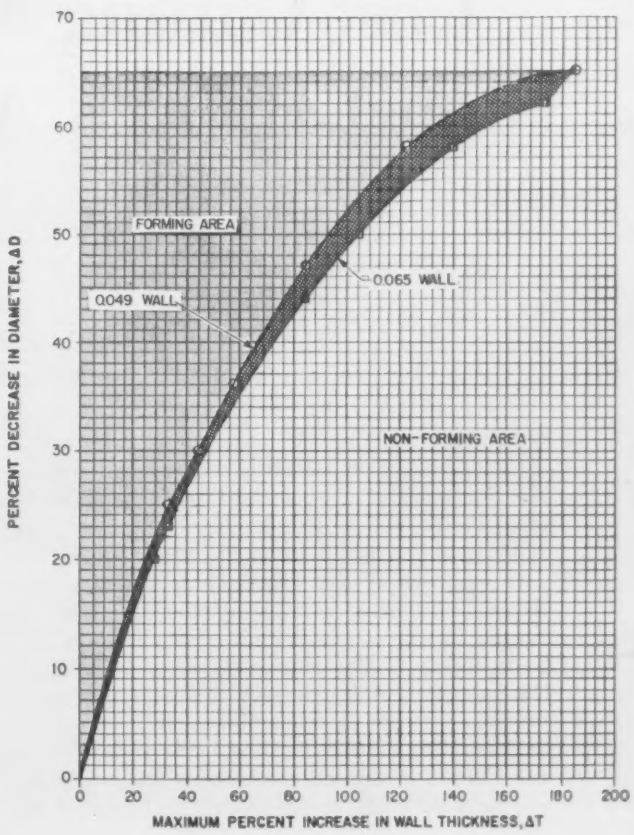
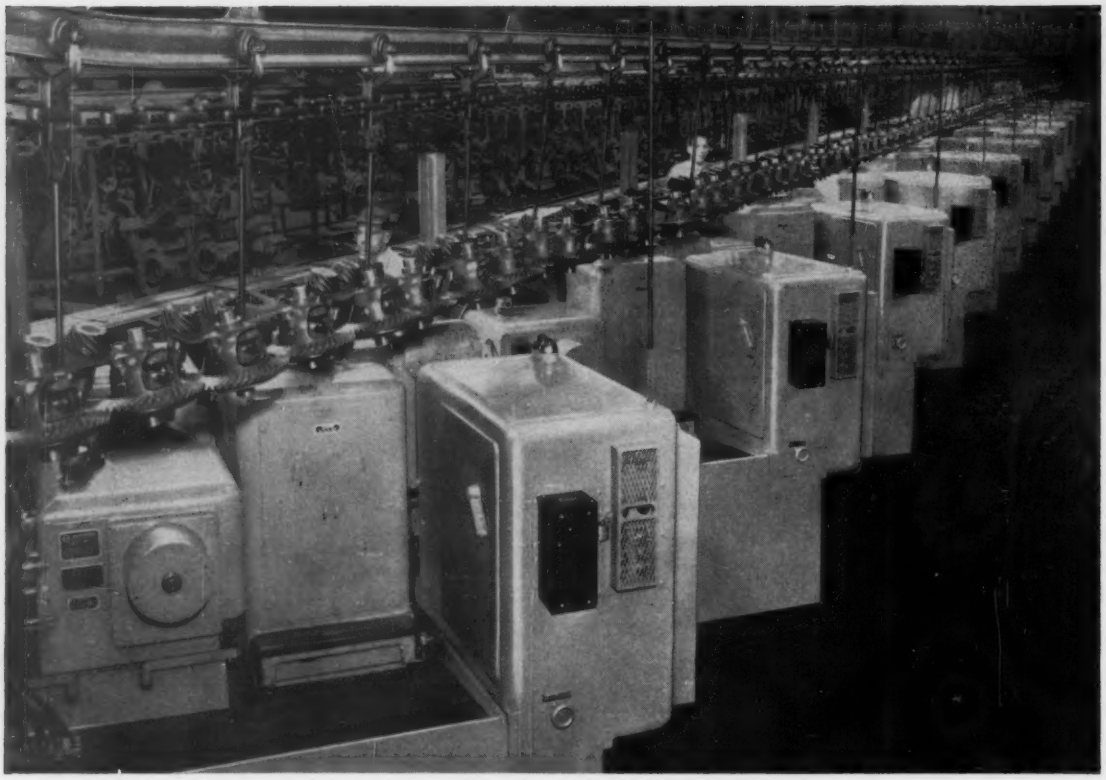


Fig. 3. (Top) Severe reduction of 62 per cent of the original diameter was made in one pass through the die. The tubing received slight, if any, twisting.

Fig. 4. (Center) Double swaging of a length of tubing is easily accomplished. One end is completed, following which the part is reversed and the operation repeated.

Fig. 5. (Bottom) Results of identical swaging operations performed on two lengths of 2024-0 (24S-0) aluminum tubing. One piece had a 0.049-inch thick wall, and the other a 0.065-inch thick wall.



Cost-Cutting Machine Tools Boost Buick's Axle Production

Multiple tooling applications and special machines are being employed for machining, forming, and welding operations to increase the production and improve the quality of axle, chassis, and steering components

By Charles H. Wick
Associate Editor

INCREASED demand for automobiles made by the Buick Division of General Motors Corporation has boosted its sales position to third in the automotive industry. To meet this demand, it has been necessary to expand production facilities at the Flint, Mich., plants, purchase special equipment, and retool existing machines. Examples of the multiple tooling applications and special machines employed to increase the output of axle, chassis, and steering parts will be described in this article.

Front propeller stub shafts are forged from S A E 1330 hot-rolled steel. Prior to machining, the stem ends of the shafts are heat-treated for a distance of approximately 8 1/4 inches. This treatment produces a hardness of 36 to 41 Rockwell C. Complete turning, including contouring and chamfering both ends of the shaft, is done on a Sundstrand automatic lathe, Fig. 1. This lathe, equipped with eight carbide cutting tools and operating at high cutting speeds and feed rates, has permitted an increase in production of 40 per cent over previous methods.

The stub shaft forging is supported in the automatic lathe between a special hexagonal, work-driving plug mounted on the headstock spindle and an air-operated tailstock center. A spindle speed of 777 R.P.M. provides a cutting

speed of about 585 feet per minute on the maximum diameter (2.88 inches) of the forging. Four triangular carbide bits are mounted in the holders on the front tool-slide, and are fed longitudinally at the rate of 0.030 inch per revolution to turn the spline, oil-seal, pilot, and flange periphery surfaces. Contouring is accomplished by means of a sliding tool-holder actuated by a cam-controlled pin.

A special overhead tool-block, equipped with a triangular carbide bit for sizing the pilot surface, is also provided on the automatic lathe. This tool is fed longitudinally at the rate of 0.015 inch per revolution (in a direction opposite to the front tool-slide) by a pivoting lever actuated by an adjustable stud on the end of the lathe carriage. Feed of the tool toward the work is accomplished by cam action, and the tool is returned to its starting position by means of an air cylinder. Three more carbide tools, mounted on the rear tool-slide, are fed toward the work-piece at the rate of 0.016 inch per revolution, to chamfer both ends of the stub shaft and its pilot surface.

From 1/16 to 1/8 inch of stock is removed from each side of the various surfaces. A completely turned shaft, as it comes from the automatic lathe, is seen at the top in Fig. 2, above a forged propeller stub shaft. Cycle time, including loading and unloading, is less than twenty-two seconds, resulting in a production of 165 shafts per hour at 100 per cent efficiency.

Steering knuckles are forged from S A E 1340 hot-rolled steel. Bearing surfaces on the knuckles are rough- and finish-turned, and fillets are formed on a Bullard four-spindle Contin-U-Matic. On this continuous, automatic, production chucking and turning machine, the four sets of tool-carrying heads and four work-rotating spindles revolve continuously around the vertical inner column of the machine. In this way, a steering knuckle is completed on each spindle in one revolution of the work-carrier.

As shown in Fig. 3, which is a close-up view of one of four duplicate set-ups on the chucking machine, the steering knuckle is supported vertically between centers. Four inserted carbide bit tools are mounted in the two holders on the right-hand slide, and two on the left-hand slide at each station. The operator merely loads forgings and removes completed steering knuckles at the front of the machine.

Steering knuckle pins were previously formed, chamfered, and cut off from S A E 1016 steel bar stock, 7/8 inch in diameter, on a Cone multiple-spindle, automatic bar machine. Then, two helical oil-grooves were milled in the periphery, a slot was milled in the end, and a flat-bottom notch was milled in the periphery of each pin, three different machines being used. Now, production has been speeded up by performing all of these operations on a Conomatic six-spindle, automatic bar machine.

By referring to the diagram in Fig. 4, it can be seen how the bar stock is supported by two rolls while the helical oil-grooves are formed at the first position on the Conomatic. The grooves,

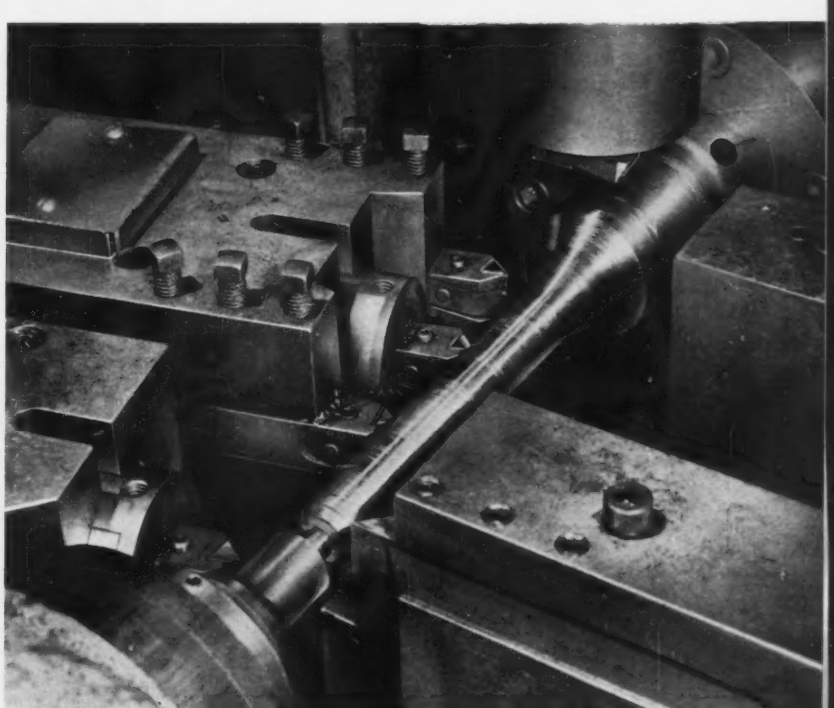


Fig. 1. Automatic lathe equipped with four carbide tools on front slide, one on overhead block, and three on rear slide for complete turning and chamfering of propeller stub shafts.

Fig. 2. Stub shaft forged from S A E 1330 hot-rolled steel is seen at bottom. After completely turning and chamfering on automatic lathe seen in Fig. 1, shaft appears as shown at top.

0.125 inch wide by 0.031 inch deep, are cold-formed by actually displacing metal with hardened and ground steel rolls mounted on the grooving attachment at this position. The second position is idle; and at the third position, the bar stock is grooved and chamfered by means of a form tool mounted on the cross-slide.

Two blades are provided at the fourth position to break down and form the steering knuckle pin while it is supported by two rolls. The wide blade removes the excess metal thrown up on the periphery of the pin during the oil-groove forming operation. When the bar stock has been indexed to the fifth position, rotation of the spindle is stopped while a milling attachment on the cross-slide is advanced to cut a flat-bottom notch 0.057 inch deep by 0.375 inch wide in the periphery of the bar. Since the notch must be accurately located with respect to the oil-grooves, precise controls are provided for stopping the spindle. Simultaneously, a milling attachment on the main tool-slide cuts a slot 0.109 inch deep by 0.187 inch wide in one end of the pin. The pin is cut off from the steel bar stock by means of a blade mounted on the cross-slide of the automatic at the sixth position.

Spindles on the automatic bar machine are rotated at 571 R.P.M., providing a cutting speed of 132 feet per minute. Feed rates for the various tools range from 0.0012 to 0.0018 inch per revolution. Cycle time is only nineteen seconds, resulting in a production of 189 steering knuckle pins per hour at 100 per cent efficiency.

Rear axle shafts, forged from S A E 1330 steel, are machined three at a time on Bullard multiple-spindle horizontal lathes, such as the

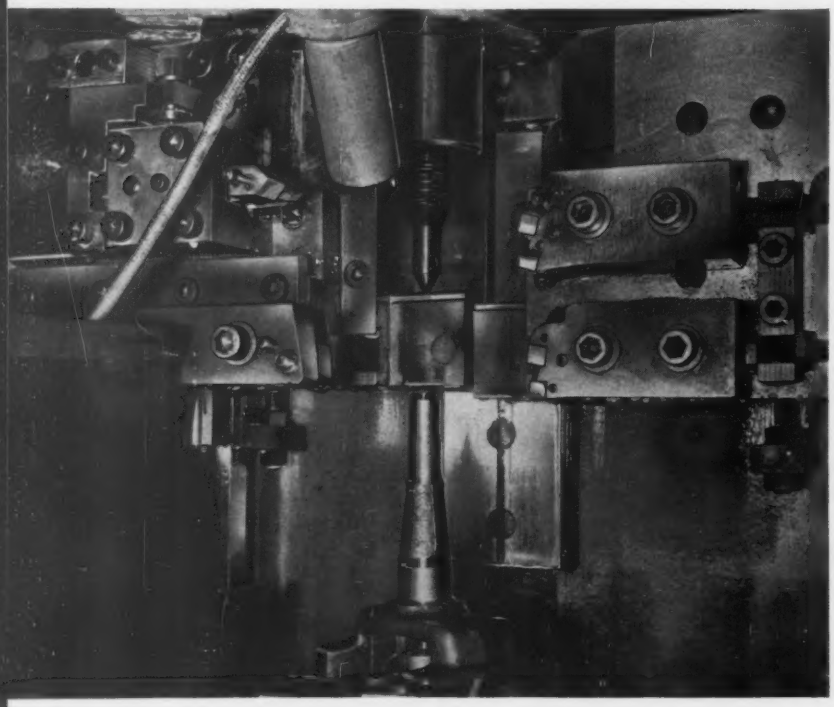
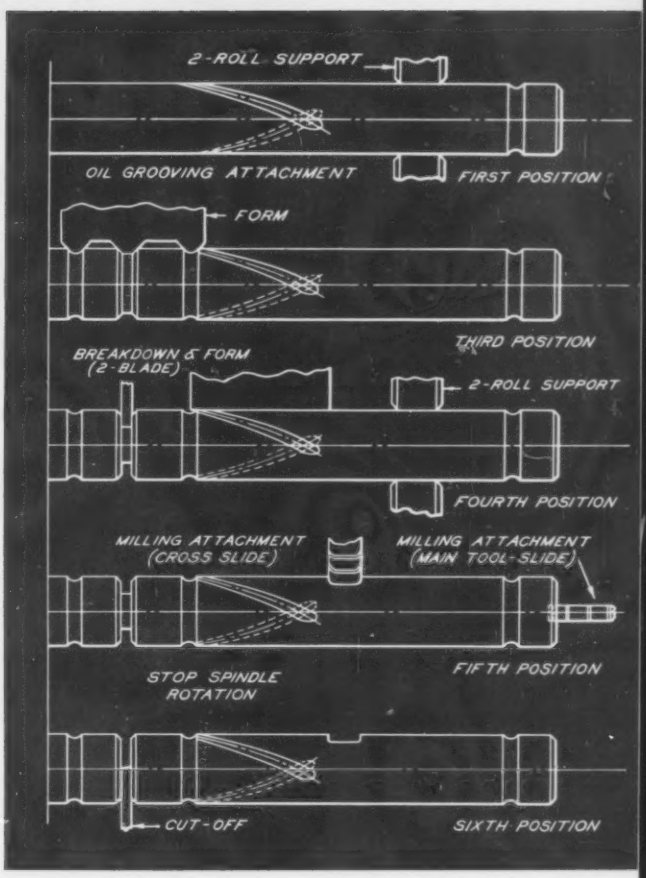


Fig. 3. One of four identical stations on a continuous chucking and turning machine employed to rough- and finish-turn bearing surfaces and form fillets on steering knuckle forgings.

Fig. 4. Operations performed at various positions on six-spindle automatic bar machine in grooving, chamfering, forming, and milling steering knuckle pins. Second position is idle.



one seen in Fig. 5. On these lathes, thirty-nine different functions are performed automatically by means of Man-Au-Trol controls. Eleven tools are used for cutting each shaft—or thirty-three on every lathe. The axle shafts are held horizontally, one above the other, and driven by headstock fixtures while supported by hydraulically operated tailstock centers. The tools are mounted vertically on a main slide, an auxiliary tool-block, and an auxiliary slide located behind the workpieces to facilitate loading and unloading. This arrangement also allows the chips to drop out of the way with the coolant. All of the tools are of the inserted-carbide type except six which are carbide-tipped.

In this operation, the spline end of each shaft is turned, chamfered, and grooved; the gear fit and oil-seal surfaces are turned; the flange is turned, chamfered, and faced on both sides; and the pilot surface is turned, chamfered, and under-cut. The Man-Au-Trol hydraulic-electric control system causes the tools to move to the left, right, up, or down—either simultaneously or one by one, as required—to perform the various operations.

Of the sixteen feeds available on these multiple-spindle horizontal lathes, eight are used for

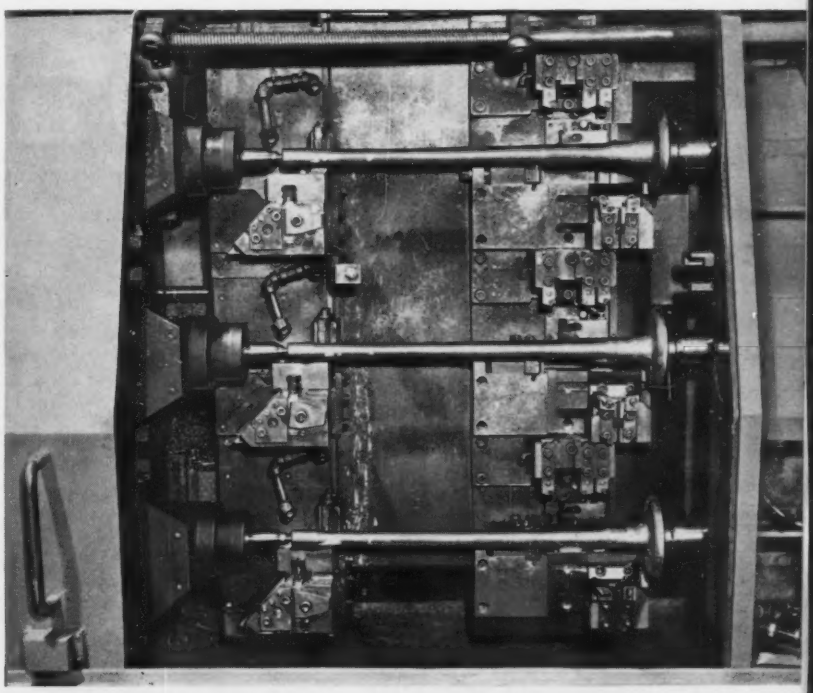


Fig. 5. Forged steel rear-axle shafts are machined three at a time on this multiple-spindle horizontal lathe. A total of thirty-three carbide tools are employed on each lathe.

Fig. 6. Close-up view of lapping operation performed on machines seen in heading illustration. Mixture of 400 grit abrasive and oil is pumped on ring gear and pinion as assembly is rotated.

this operation. The feed rates employed vary from 0.003 to 0.043 inch per revolution. Two spindle speeds, 378 and 756 R.P.M., provide cutting speeds varying from 198 to 680 feet per minute. Machine cycle time is 2.817 minutes, and loading and unloading time is 0.5 minute, giving a floor-to-floor time of 3.317 minutes for three axle shafts, or forty-three shafts per hour at 80 per cent efficiency. One operator can conveniently take care of machines.

Improved quality of rear axle differential and gear ratio assemblies is obtained by refining the tooth surfaces of the ring gears and pinions on the battery of Gleason gear lapping machines seen in the heading illustration. Prior to lapping, the gears are machined, carburized, hardened (60 to 63 Rockwell C), and ground. The electronically controlled, automatic lapping machines run the mating gears under a light load (30 to 35 pounds per square inch) with a liquid abrasive compound, while the relative positions of the ring gear and pinion are continuously and automatically changed. The length of lapped surface from heel to toe of the gear teeth can quickly be changed by means of adjustable cams; and the amount of backlash can be automatically controlled, thus eliminating the need for making adjustments manually.

First, a pinion is mounted in the lapping machine and clamped by means of a hydraulically actuated draw-rod. Then a ring gear, assembled to a differential case, is positioned on a spindle at right angles to the axis of the pinion, Fig. 6, by means of a bayonet lock. The ring gear can be moved up and down, or in and out, to obtain the proper lapping position, while the position of the pinion remains fixed. Both gears are rotated as 400 grit abrasive, mixed with oil in the ratio of one to one by weight, is pumped on the gears. After rotating the gears in one direction for three minutes, the direction is reversed; and, after three more minutes, rotation is stopped. Lapped ring gears and pinions are kept together

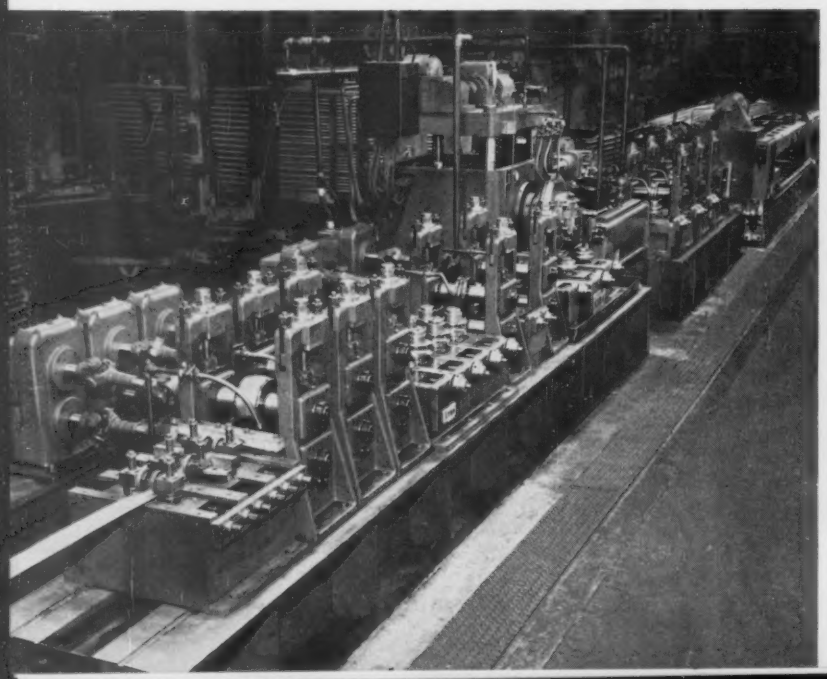
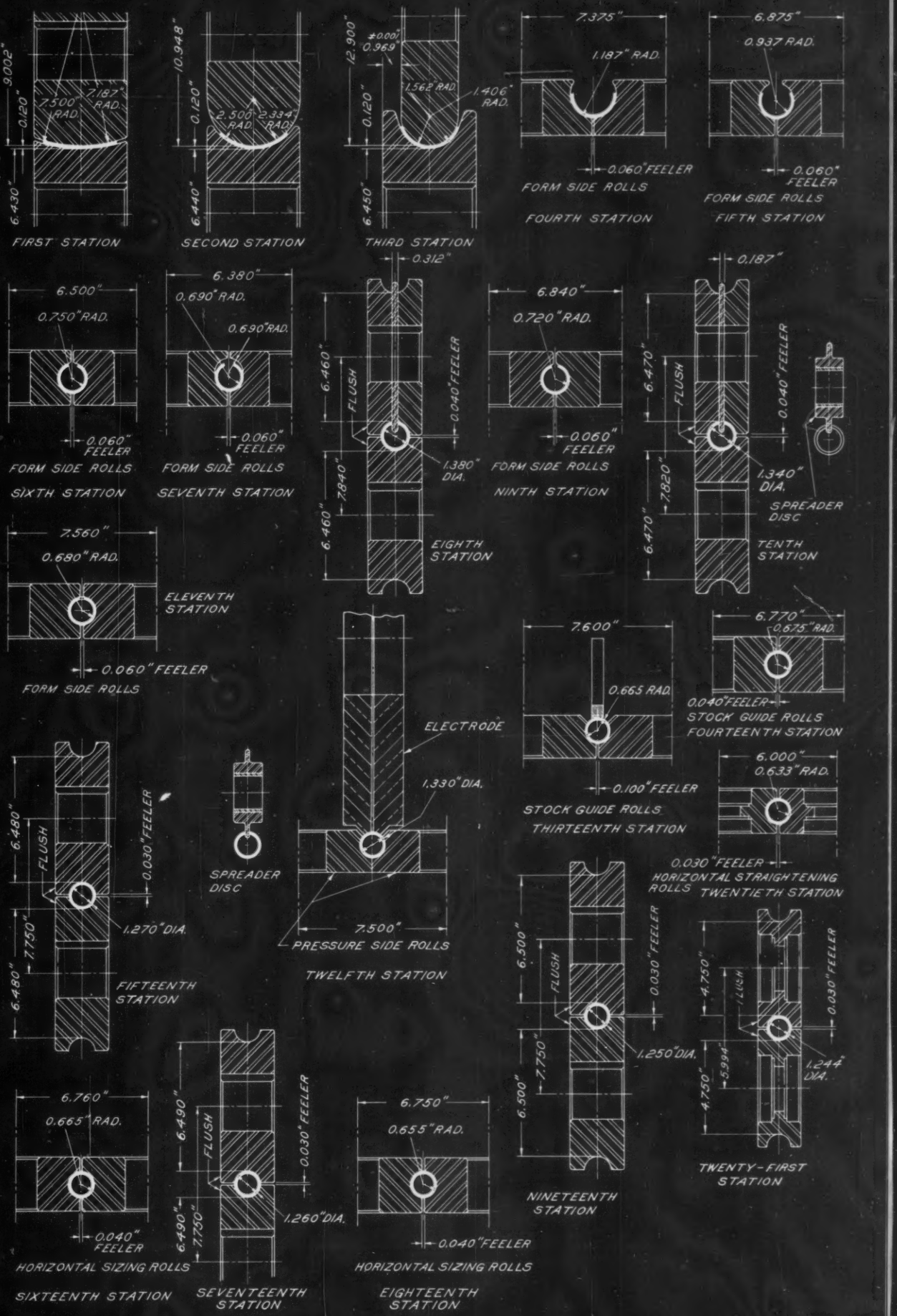


Fig. 7. (Left) Flat coil stock 3.820 inches wide (seen at lower left) is formed into tubing 1.250 inches in diameter, welded, and cut off to the required length at the rate of 90 feet per minute in this tube mill.

Fig. 8. (Opposite page) Forming, welding, sizing, and straightening operations performed at successive stations on tube mill seen in Fig. 7. Side pressure rolls support tubing during welding at twelfth station.


9.002"
0.120"
6.430"
7.500" RAD.
7.187" RAD.
FIRST STATION
10.948"
0.120"
6.440"
2.500" RAD.
2.334" RAD.
SECOND STATION
12.900"
±0.001"
0.969"
0.120"
6.450"
1.562 RAD.
1.406" RAD.
THIRD STATION
7.375"
1.187" RAD.
0.060" FEELER
FORM SIDE ROLLS
FOURTH STATION
6.875"
0.937 RAD.
0.060" FEELER
FORM SIDE ROLLS
FIFTH STATION
6.500"
0.750" RAD.
0.060" FEELER
FORM SIDE ROLLS
SIXTH STATION
6.380"
0.690" RAD.
0.690" RAD.
0.060" FEELER
FORM SIDE ROLLS
SEVENTH STATION
0.312"
6.460"
FLUSH
7.840"
6.460"
0.040" FEELER
1.380" DIA.
EIGHTH STATION
6.840"
0.720" RAD.
0.060" FEELER
FORM SIDE ROLLS
NINTH STATION
0.187"
6.470"
FLUSH
7.820"
6.470"
0.040" FEELER
1.340" DIA.
SPREADER DISC
TENTH STATION
7.560"
0.680" RAD.
ELEVENTH STATION
0.060" FEELER
FORM SIDE ROLLS
ELECTRODE
1.330" DIA.
7.500"
PRESSURE SIDE ROLLS
TWELFTH STATION
7.600"
0.665 RAD.
0.100" FEELER
STOCK GUIDE ROLLS
THIRTEENTH STATION
6.770"
0.675" RAD.
0.040" FEELER
STOCK GUIDE ROLLS
FOURTEENTH STATION
6.480"
FLUSH
7.750"
6.480"
0.030" FEELER
1.270" DIA.
FIFTEENTH STATION
SPREADER DISC
6.000"
0.633" RAD.
0.030" FEELER
HORIZONTAL STRAIGHTENING ROLLS
TWENTIETH STATION
6.500"
FLUSH
7.750"
6.500"
0.030" FEELER
1.250" DIA.
NINETEENTH STATION
4.750"
FLUSH
5.994"
4.750"
0.030" FEELER
1.244" DIA.
TWENTY-FIRST STATION
6.760"
0.665" RAD.
0.040" FEELER
HORIZONTAL SIZING ROLLS
SIXTEENTH STATION
6.490"
FLUSH
7.750"
6.490"
0.030" FEELER
1.260" DIA.
SEVENTEENTH STATION
6.750"
0.655" RAD.
0.040" FEELER
HORIZONTAL SIZING ROLLS
EIGHTEENTH STATION

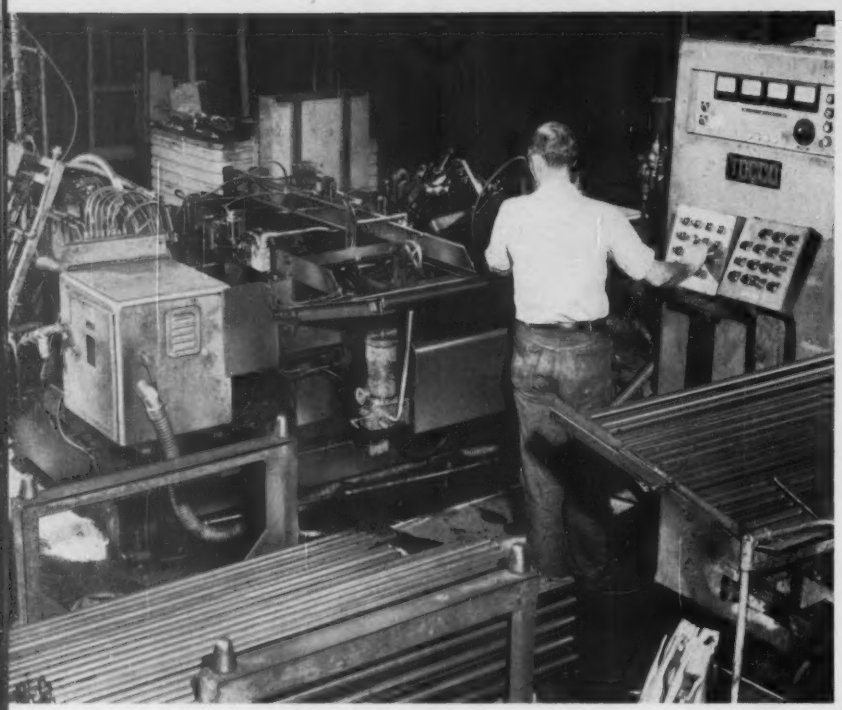


Fig. 9. Special magazine-loaded, automatic transfer machine for induction annealing, flattening, and piercing both ends of rear-axle strut rods at rate of one every eleven seconds.

in matched pairs. After testing for contact area and noise, they are ready for assembly.

Rear-axle strut rods are made from S A E 1008 welded steel tubing, 1.250 inches in diameter and with 0.120-inch thick walls. The tubing is formed from coil stock 0.120 inch thick by 3.820 inches wide, welded, and cut off in four-unit lengths on the Etna tube mill seen in Fig. 7. This mill can produce 1 1/4-inch diameter tubing at the rate of 90 feet per minute, contrasted with 28 feet per minute previously obtained on older mills. The mill is equipped with a Reliance variable-speed drive unit for quickly changing spindle and carriage speeds.

As the coil stock passes through the tube mill, it is progressively formed by pairs of upper and lower or side rolls, as shown diagrammatically in Fig. 8. At the first three stations, upper and lower rolls successively form the flat stock to approximately a semicircular cross-section having an outside radius of 1.562 inches. Side forming rolls at the next four stations of the tube mill further bend the stock to approximately a circular cross-section.

Prior to welding the tubing with copper electrode rings at the twelfth station, the opening between the edges of the formed coil stock is carefully sized by upper and lower form rolls, side form rolls, and spreader discs. A pair of side rolls exert pressure on the tube during welding. The welding bead is sheared from the tube by a shaving tool at the thirteenth station. Sizing and straightening of the welded tubing is done by pairs of vertical and horizontal rolls at the succeeding stations.

A cam-actuated unit having two cut-off blades is provided at the end of the mill for separating the continuous welded tubing into lengths measuring 22 feet 10 1/4 inches. Each length is used to make four rear-axle strut rods. When a coil of stock at the loading end of the tube mill has been depleted, a new coil is butt-welded to its end, using a Federal 200 K.V.A. flash-welding machine for this operation.

Both ends of each rear-axle strut rod are annealed, flattened, and pierced on special Mid-West machines, such as the one seen in Fig. 9. Tubes cut to the required length are loaded into a magazine from which they are automatically fed one at a time, into two Tocco induction heating coils—one for annealing each end of the tube. However, with the improved quality of steel now being obtained, and the better welding performed on the new Etna tube mill, it has been found that annealing of the tube ends prior to flattening and piercing is no longer required. The tube is automatically transferred to a position between two pairs of upper and lower dies, where both ends are hydraulically flattened.

At the next station, one side of the machine is provided with an upper and a lower die and a stripper for piercing a hole 0.302 inch in diameter in one end of the tube. The opposite side of the machine has a similar tooling set-up for piercing a 9/16-inch diameter hole in the other flattened end of the tube. Both piercing dies are

hydraulically operated. Completed strut rods are automatically unloaded at the end of the machine. A strut rod is completed every eleven seconds on each machine, and one operator can attend two machines.

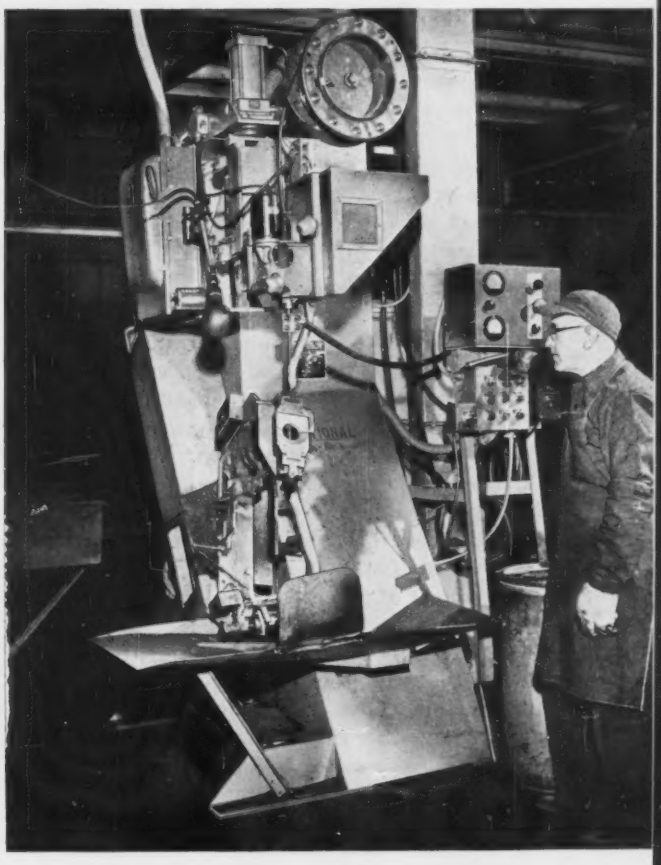
Defroster distribution duct tubes are made from S A E 1010 welded steel tubing, 2.250 inches in outside diameter with 0.026-inch thick walls. After cutting to the required lengths, the tubes are flanged and crimped on the Warco 5-ton crank press illustrated in Fig. 10, at the rate of 1200 per hour. An operator merely places tubes into the eight dies on the rotary indexing table of the press. As each die is positioned below the punch, a flange 2.490 inches in diameter by 0.052 inch thick is formed 0.20 inch from the top of the tube, and the tube bottom is taper-crimped to a minimum diameter of 2.210 inches for a length of 0.26 inch. When each tube has been indexed past the punch, it is automatically lifted from the die and ejected from the press by a blast of compressed air.

Dual front exhaust pipe assemblies consisting of two pipes and a flange are automatically joined together by submerged-arc welding on the special National machine seen in Fig. 11. This machine is equipped with an automatic Lincolnweld head that quickly produces uniform, sound welds of high penetration. The submerged-arc, or hidden-arc, type welds are made with 3/32-inch diameter coated copper wire, employing granular flux which is fed automatically from a hopper.

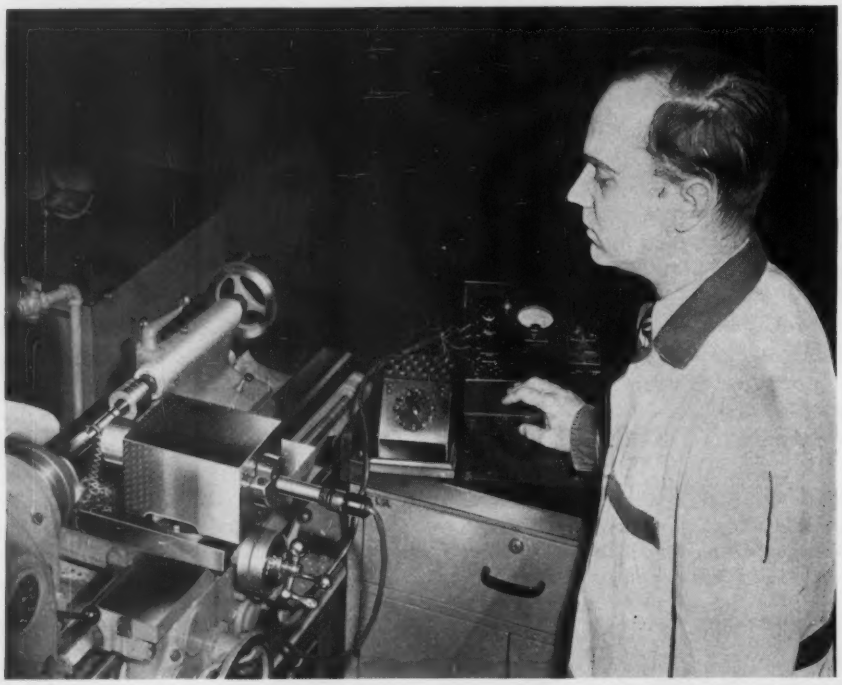
A left-front exhaust pipe assembly, a right-front exhaust pipe assembly, and a flange are manually located and clamped in the air-cylinder and lever actuated rotating fixture. The instant the copper wire electrode strikes an arc, the work-pieces start to rotate. A standard feeding device is employed to draw the electrode wire from a reel located above the welding head. When the exhaust pipe assembly has made a complete revolution, the electric current is automatically shut off, and the flux and wire feeds stop. With this set-up, fifty-five assemblies can be welded per hour. Unfused flux is screened, collected, and returned to the feed hopper.

Fig. 10. Eight-station rotary indexing table is provided on this 5-ton crank press for flanging and crimping defroster distribution duct tubes at 1200 per hour.

Fig. 11. Automatic head, 3/32-inch diameter coated copper wire, and granular flux are employed on this machine for submerged-arc welding of dual front exhaust pipe assemblies.



Optimum Machining Conditions Determined with Dynamometer



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To determine optimum cutting conditions for many industrial machining applications, it is important to understand the relationship of the forces acting upon the tool bit. The magnitudes of these forces will vary with each tool shape and type. Other variable factors that greatly influence the forces set up during machining are the work material; coolant; and combination of speed, feed, and depth of cut. The proper choice of tool bit for any particular operation will be the one exhibiting the best cutting characteristics—that is, the one that requires the least amount of power, provides the best surface finish, gives the longest tool life, and satisfies any other requirements which may vary in importance from job to job.

The combinations of variables encountered in metal-cutting are infinite. Therefore, the best method to use in determining the optimum cutting conditions is to devise a logical tool, coolant, and machine setting, and then test these choices by conducting an experiment to determine if alteration of any of the set conditions improves the cutting characteristics.

It is possible to measure some of the quantities that are indicative of tool performance. One of the easiest instruments to use is a wattmeter. If the meter is connected into the electrical circuit immediately preceding the motor, it will give an indication of the power consumed by the motor. Of course, the efficiency of both the motor and the machine must be known to be able to compute the power actually delivered to the cutting tool. Usual machine efficiency runs in the neighborhood of 70 per cent. Therefore, the power delivered to the tool bit will be approxi-

mately 0.70 multiplied by the output horsepower of the motor.

A tachometer of either the mechanical or electrical type, or even a simple revolution counter, is important for measuring the spindle speed. The speed of most machines varies under load, and can be determined only by measurement.

Lathe tool dynamometers provide the most accurate means of testing lathe tools under load. Earlier types provided mechanical amplification of the tool deflection. This deflection was multiplied by a system of levers to a magnitude that could be detected by a dial indicator reading in 0.0001 inch. With this set-up, the deflection would have to be 0.00001 inch before it could be detected. In such an instrument, it is often difficult to eliminate errors due to friction and play. Also, these devices are generally insensitive and tend to chatter excessively. They have, in the main, been replaced by electrical strain gage types.

With the development of the widely used electrical strain gage, design of an efficient lathe tool dynamometer became more practicable. The tool was mounted rigidly and, when the deflections were small, it was possible to measure the strain in the beam to which the tool was attached. This strain was detected by the extremely sensitive resistance wire strain gages which are capable of measuring a change in length of 0.000001 inch per inch. A typical set-up employing strain gages for checking the forces acting on a tool bit during a routine turning operation may be seen in the heading illustration.

The design of the lathe dynamometer, Fig. 1, may be described simply as a beam, firmly fixed at one end, having a tool bit secured at the opposite end (section A-A). As the load is applied to the end of the tool bit, it is forced down; thus the upper portion of the beam is stretched while the lower portion is compressed.

To measure the amount of deflection at the cutting end of the tool bit, strain gages are cemented to all four sides of the beam supporting the tool bit (section B-B). The gages are composed of very fine wire which changes in thickness as it is stretched or compressed. The change in thickness causes a change in electrical resistance. Increasing thickness decreases resistance; inversely, decreasing thickness increases resistance.

The two strain gages cemented to the top and bottom surfaces of the beam are connected into a Wheatstone bridge circuit, Fig. 2, to measure any change in resistance. This circuit is so devised that the strains at the top and bottom, although the one is tensile and the other is compressive, are added. The strain effect is heightened by this arrangement and increases the sensitivity of the dynamometer.

So far, only the downward force on the tool has been mentioned, but the same arrangement can be used to measure side thrust in a two-component dynamometer. There are only two forces, or components of force, measured by this type of unit. One force is measured in a downward direction on a lathe, while the other force is measured parallel to the outer surface of the work-piece and in the opposite direction of the feed. This design of dynamometer is relatively insensitive to any compressive force acting against the end of the tool bit which tends to push the tool into the holder. Therefore, no arrangements have been made to measure this force. However, a three-component dynamometer does measure this downward compressive force on the tool.

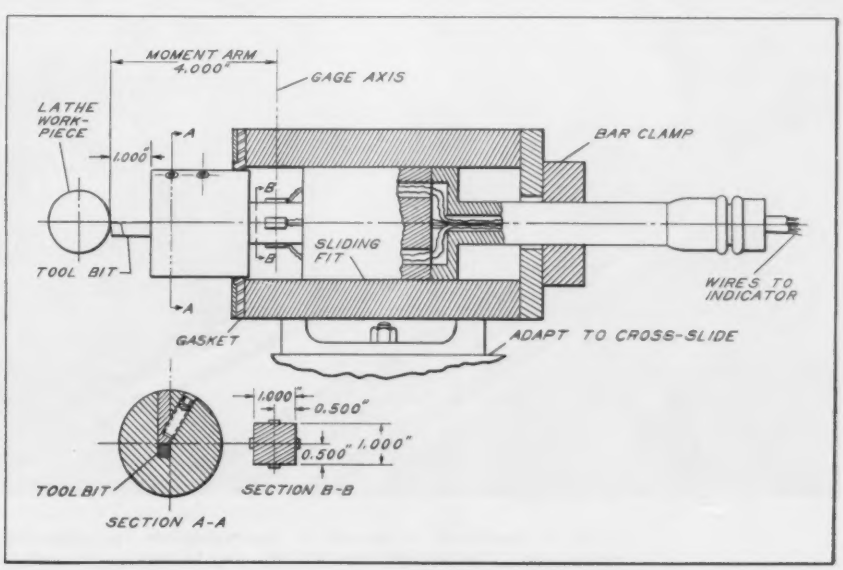


Fig. 1. Diagram of a two-component strain gage type of lathe tool dynamometer. A clamp on the end of the housing holds the central shaft in its pre-set position.

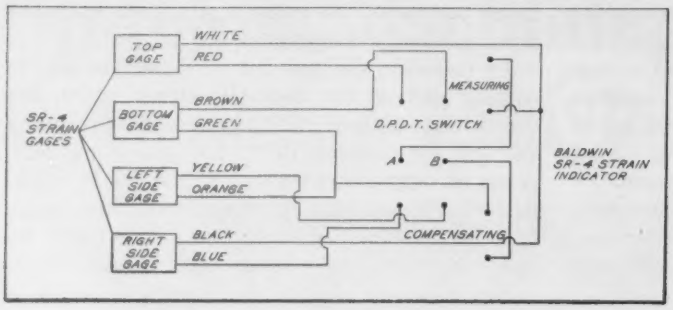


Fig. 2. Wiring diagram showing dynamometer electrical circuit

For calibrating the two-component dynamometer, a special tool bit is inserted into the toolholder, Figs. 3 and 4. The pattern of holes observable in the sides and end of the tool is repeated in the top. For most purposes, it is not necessary to calibrate for load application in all holes of the tool, but merely to use the hole which lies on the central axis of the beam and 1.000 inch from its outer end.

The other holes in the calibration tool are used to investigate the effect of eccentric loading of the beam. Such a situation would be encountered when the cutting edge of the tool bit does not lie in the neutral axis of the beam. This occurs with a tool having a cutting edge not perpendicular to the direction of cutting. Unless the center of cutting forces is greatly off center, however, the force readings provided by the equipment will not be seriously affected. The load applied at this point and the change in resistance indicated on the Baldwin strain indicator visible in Fig. 3, are proportional. Therefore, a straight-line curve would be the result of plotting a graph.

The two Wheatstone bridge circuits can be connected alternately to the indicator by means of the switch box at the left-hand side of the indicator (Fig. 3). Also, it is possible to connect the strain gages into the bridge by using a double-throw switch, as indicated in the wiring diagram. Using the latter method simplifies the instrumentation.

A dynamometer is helpful in determining the design of the optimum cutting tool for any particular application. Practically all of the energy expended in a cutting operation is dissipated in the form of heat. This form of energy dissipation is detrimental to tool life because it increases the temperature at the cutting edge. It is therefore evident that the forces which determine the power required are important.

Power for a lathe cutting tool which is feeding uniformly, either to the left or right, while taking

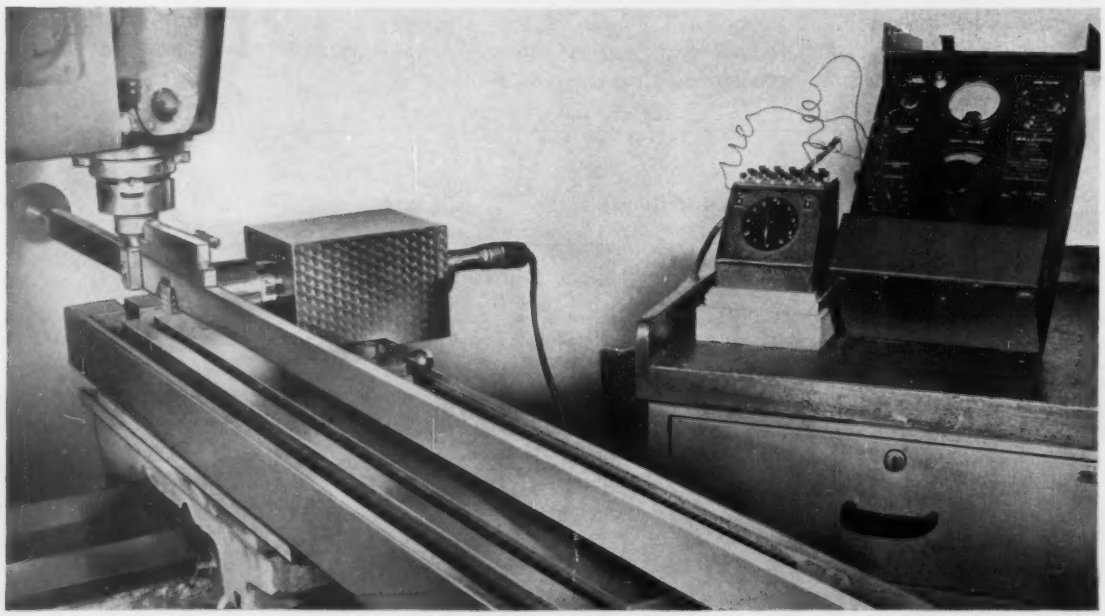


Fig. 3. A special bit is inserted in the tool-holder for calibrating the dynamometer. The Baldwin strain indicator may be seen on the work-bench.

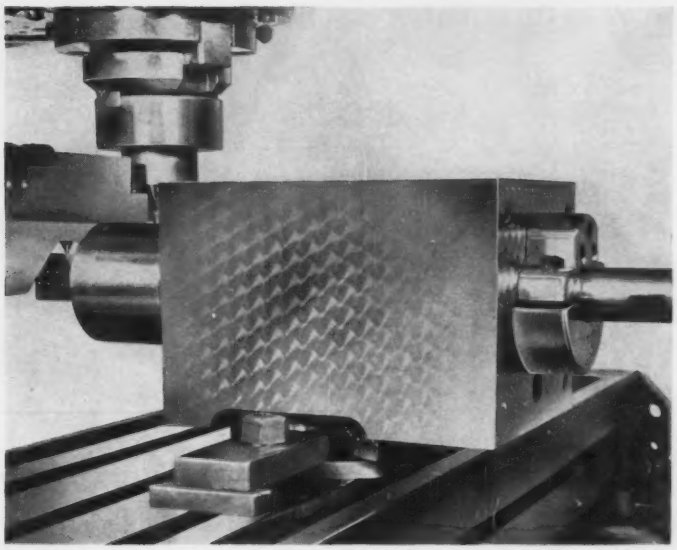


Fig. 4. Close-up view of dynamometer during calibration, showing special bit. Hole patterns in the bit provide correct positioning for the application of eccentric as well as concentric loads.

a cut of constant depth, may be calculated by using the formula:

$$P = P_t + P_f$$
$$= 2\pi rF_dN + fNF_f$$

in which

P = power required by lathe cutting tool, in inch-pounds per minute;

P_t = power associated with the torque, in inch-pounds per minute;

P_f = power associated with the feed, in inch-pounds per minute;

F_d = downward force at end of tool bit, in pounds (dynamometer being calibrated to some distance out from end of beam, in this case 1 inch);

F_f = force in direction of feed, in pounds;

r = radius of work-piece being cut, in inches (distance from center of work-piece to calibration point on tool bit, as explained above);

N = speed of work rotation (R.P.M.);

f = feed (inches per revolution).

As has already been mentioned, practically all the power consumed in the cutting operation appears as heat at the cutting edge of the tool. To convert power in inch-pounds per minute to units per minute, it is necessary to divide by 9338. The resulting value is merely an indication of the temperature at the cutting edge (the greater the value, the higher the temperature) and is of no practical use unless the size of the tool is considered. For instance, if the depth of cut is 0.250 inch, and the heat dissipated is 25 Btu, it follows that the power dissipation is 100 Btu per inch.

Application of the dynamometer in determining the power requirements for a lathe operation can be illustrated by the results of an actual experiment, shown in Tables 1 and 2. For the runs listed in Table 1, a high-speed steel tool bit was employed to straight-turn a 1.937-inch diameter bar of 0.09 carbon steel. Two factors remained constant—the feed at 0.0076 inch per revolution, and the depth of cut at 0.020 inch. Three tests were run at different spindle speeds, namely, 200, 500, and 700 R.P.M.

A second set of tests, consisting of four individual runs, was made. In each of these runs, a 1.994-inch diameter bar of 0.10 carbon leaded-steel was turned with a high-speed steel tool bit.

Table 1. Dynamometer Readings under Varying Spindle Speeds

Test Number	Spindle Speeds, Revolutions per Minute	Downward Strain, Micro-Inches per Inch	Downward Force, Pounds	Sidewise Strain, Micro-Inches per Inch	Sidewise Force, Pounds
1	700	64	85	16	19
2	500	42	65	16	19
3	200	61	80	16	19

Table 2. Dynamometer Readings under Varying Depths of Cuts

Test Number	Depth of Cut, Inch	Downward Strain, Micro-Inches per Inch	Downward Force, Pounds	Sidewise Strain, Micro-Inches per Inch	Sidewise Force, Pounds
4	0.100	199	255	70	90
5	0.075	166	210	59	72
6	0.050	112	145	41	52
7	0.025	59	78	17	21

Table 3. Calculations Based on Data Compiled in Tables 1 and 2

Test Number	P_t $(2\pi rF_dN)$, Inch-Pounds per Minute	P_f (fNF_t), Inch-Pounds per Minute	P $(P_t + P_f)$, Inch-Pounds per Minute	Horsepower (P/396,000)	Btu per Minute	Depth of Cut, Inch	Btu per Minute per Inch
1	362,075	101.08	362,175	0.9145	38.79	0.020	1939.5
2	197,777	72.20	197,848	0.4996	21.19	0.020	1059.5
3	97,365	28.88	97,394	0.2459	10.43	0.020	521.5
4	311,497	87.75	311,585	0.7868	33.37	0.100	333.7
5	256,527	70.20	256,592	0.6480	27.48	0.075	366.4
6	177,126	50.70	177,173	0.4474	18.97	0.050	379.4
7	95,282	20.48	95,301	0.2407	10.21	0.025	408.4

Unlike the conditions of the previous tests, the spindle speed remained constant at 195 R.P.M. and the feed at 0.005 inch per revolution. The variable factor was the depth of cut, which ranged from 0.025 to 0.100 inch. Results of this group of tests are shown in Table 2.

It is interesting to note from Table 3 what effect the various components such as speed, feed, and depth of cut have upon the amount of heat which may be considered as being dissipated along the cutting edge of the tool. An important observation is that for constant speed and feed, the greater the depth of cut the less the amount of heat that is dissipated per inch of cutting edge (tests 4 through 7).

From the foregoing, it is possible to obtain an idea of the many potential uses for the lathe tool dynamometer. The data obtained from such an instrument can be analyzed in conjunction with data obtained from other instruments. The analysis can then be used to form the basis for decisions regarding the proper design and employment of cutting tools for attaining optimum production efficiency in the shop.

Automatic Press Set-Up Reduces Can Rejects

High rates of rejections on finished parts and cumbersome space-consuming equipment were two problems solved when the Vulcan Tin Can Co., Bellwood, Ill., mechanized its can blanking and redrawing operations. The redrawing operation, formerly performed manually, is now done on a Multipress manufactured by the Denison Engineering Co. The press is equipped with a rotary index-table, as seen in the accompanying illustration.

The action of the index-table is interlocked through the hydraulic system of the 6-ton press for positive sequence of movement, with the table regulated for approximately thirty-five indexes per minute. A magazine, seen at the upper left, feeds the drawn cans to the table, and a brush-off rail and chute device disposes of the redrawn parts to make the operation completely automatic. A nozzle sprays lubricant on each part prior to redrawing as an added precaution against damage.

Automatic magazine feed, a rotary indexing table, and an automatic unloading device are employed for this can redrawing operation.

Automobile Rocker Arms Cast 280 at a Time

Plastic-bonded sand shells are "compaction" molded, then stacked to form a compact mold for economically casting 280 automotive rocker arms in a single cluster

A SIGNIFICANT variation of the shell-molding process has been achieved in casting automotive rocker arms at the Ford Motor Co., Ltd., Dagenham, England. Rocker arms for the Consul four-cylinder and Zephyr six-cylinder overhead valve engines are now being cast in "compaction" type molds, a variation of shell molds, instead of being cast in conventional green-sand molds.

The weight of the metal formerly poured into each green-sand mold was 26 pounds, out of which twenty-four castings were obtained. Each casting had a solid boss through which a 3/4-inch diameter hole had to be drilled and reamed to receive the rocker-arm shaft.

With this new method, the mold is built up of individual shells, or cores, each having fourteen cavities. The completed mold consists of twenty cores, or individual shell molds, and contains 280 casting cavities. A total of 111 pounds of poured metal is required to fill the mold. This represents a reduction of approximately 63 per cent in the quantity of poured metal required per casting.

The metal saved is not the only advantage of this newly adopted technique. The castings are now produced with the shaft hole cored to such a size that a broaching operation is all that is required to finish it. Compaction-molded castings are considerably more accurate than their green-sand counterparts, and, as may be seen in Fig. 1, have a much better surface finish. A green-sand casting is shown at the left, a compaction-molded casting in the center, and a finished machined component at the right.

Four operators are engaged in making the cores; working at normal speeds, they can produce up to 120 per hour. At this rate of production, as many as six complete molds can be made and assembled per hour. A fifth operator aids in assembling the mold and also pours the metal.

Mold Material and Handling Procedure

Before describing the methods by which the cores are produced, it is of interest to consider the materials and the handling procedure em-

Fig. 1. Green-sand cast rocker arm at the left has been replaced by the "compaction" molded, cast rocker arm, center. At the right is a finish-machined component.

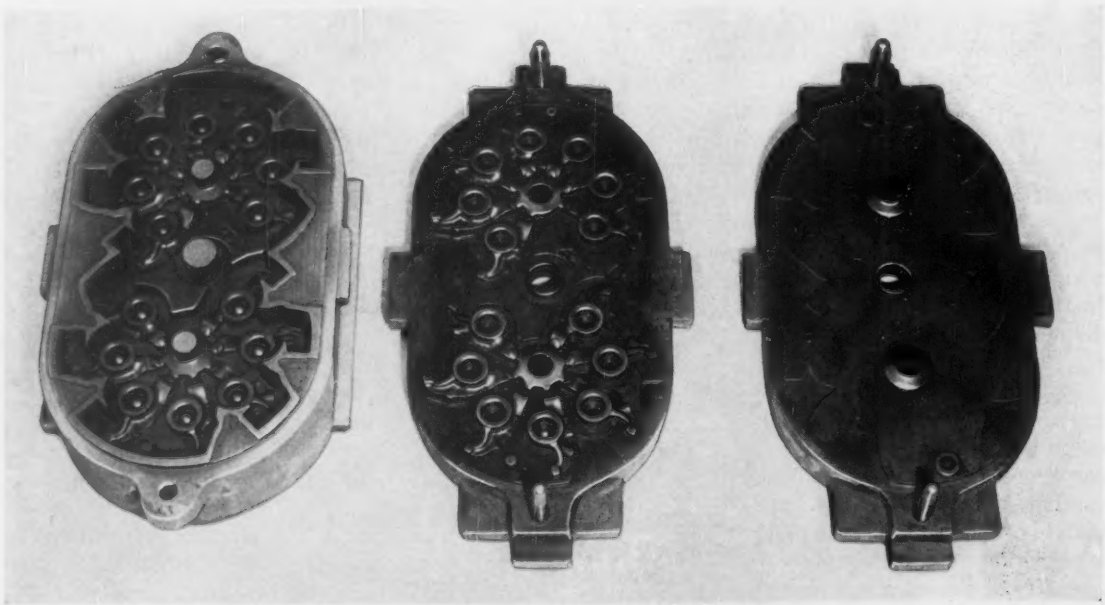
ployed. Silica sand with an average fineness of A.F.S. 140 is transported on a conveyor to the core-making department. Here the sand is dried in a continuous type rotary gas-fired oven, from which it is fed into a storage hopper by means of a bucket type elevator. On its way to the hopper, the sand passes over a vibratory screen which separates any lumps that may be present.

When a mix is to be prepared, the sand is withdrawn from the hopper through a trunk and weighed. A total of 96 1/2 pounds of sand is loaded into a mixer. To this is added 3 1/2 pounds of a high-quality phenolic resin, and the entire batch is mixed for five minutes. The mixture is then transferred to another type mixer where it is tumbled for an additional five minutes to insure thorough blending. Random samples are taken from the mixer and laboratory tested for resin content. This sand and resin mixture is transferred to the hopper of a core-making unit.

Cores are made, and the molds assembled, in a separate section of the foundry where special equipment is installed. The individual pieces of core-making equipment are laid out in the form of a rectangle and are linked together by roller conveyors.

One long side of the rectangle is occupied by a curing oven equipped with a chain conveyor for moving the core-boxes through the heating zone. The oven is 31 feet long with a centrally located, 14-foot long heating zone. This zone is maintained at a temperature of approximately 600 degrees C. by thermostatically controlled electric radiant heating elements. These elements are arranged in banks of three, one bank on each side of the furnace and one at the bottom. They have a total capacity of 75 K.W. To the left of the outlet end of the furnace is a stripping unit, and from there the roller conveyor leads to an investment unit.

Fig. 2. A typical lower half core-box (left) and two styles of upper half core-boxes (center and right) used for producing compaction mold shells



Some of the cast-iron core-boxes are shown in Fig. 2. The rocker-arm pattern inserts were produced almost completely by conventional shell molding, from master metal patterns on which double shrinkage allowances were provided. Therefore, very little machining was required on the actual pattern forms. At the left-hand side of the illustration is a half core-box for producing either a single- or double-sided core. If it is employed in conjunction with the half core-box in the center, a double-sided core having fourteen half-impressions on each side will be produced. As previously mentioned, twenty such cores are assembled into each complete mold.

A core with half-cavities on one side only is required at both the top and bottom of the mold stack. These cores are produced by means of the half core-box at the right-hand side of the illustration (Fig. 2), which is used together with the half core-box at the left to make a single-sided core. A similar single-sided core of the opposite hand is also needed and is made with another special half core-box. Six complete boxes for producing double-sided cores are provided, together with one each for the top and the bottom cores, and one for a simple runner core which connects the sprue holes at the base of the mold.

From Sand-Resin Mixture to Finished Mold

The first step in producing the core is to apply a layer of stripping emulsion to the pattern surface of the core-box. This is done in the automatic spraying unit shown in Fig. 3. Leather strip curtains cover the entrance and exit apertures through which the boxes pass.

A conveyor roller at the entrance to the spraying unit is mounted on a pair of hinged levers, one of which may be seen at *A* in Fig. 3. As the core-box passes over the roller, a valve is opened which allows the stripping emulsion, consisting of a 2 1/2 per cent silicone emulsion in water, to enter a row of nozzles at the top of the unit. The upper surface of each core-box is thus sprayed as it passes through. Any excess stripping emulsion drains into a sump located beneath the conveyor track, from which it may be recovered for subsequent use. Prior to this treatment, however, the operator employs a jet of compressed air to remove any adhering particles of the sand-resin mixture from the pattern surface.

After spraying, the core-box is moved to an investment unit, Fig. 4. Here, the lower member of each core-box is slid from the conveyor onto a flat surface in front of the dispensing hopper. Beneath the hopper outlet is a continuously moving flat belt on which the core-boxes are carried at a controlled speed. Before being transferred to the moving belt, an aluminum stencil plate, shown upside down at *B*, is placed over each box. The purpose of this plate is, among its other functions, to prevent the sand-resin mixture from reaching those portions of the core-box where it is not required. It is also provided with projections to control the amount of mixture at those places where a smaller quantity is needed.

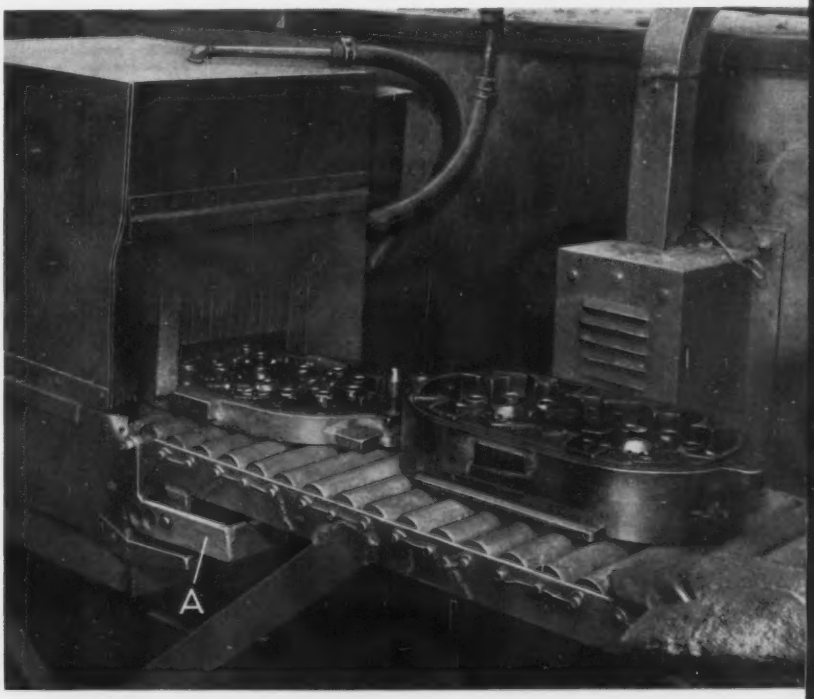


Fig. 3. Core-boxes are coated with a solution of 2 1/2 per cent silicone and water in this automatic spray unit. A roller connected to lever (A) controls the spray.

Fig. 4. The investment unit showing the lower end of the dispensing hopper. A stencil plate (B) is placed over the core-box to insure proper distribution of sand.

The stencil plate is turned over before being placed on the box so that the two cam surfaces *C* project upward. These cam surfaces lift two rollers as they pass beneath the hopper, with the result that a flap is opened to allow the sand-resin mixture to flow into the core-box. At the same time, a barrel sleeve is closed to shut off the main sand supply.

One of the actuating rollers may be seen at *D* in Fig. 5, which shows the opposite side of the hopper. A blade *E* strickles off any excess sand mixture into a channel at one end of the stencil plate, leaving the sand in the box level with the surface of the stencil.

After leaving the hopper, the filled core-box is transferred to another operator who removes the stencil, empties the overflow sand into a bin, and returns the core-box to the feeding side of the hopper on a short section of roller track. He then moves the filled box to a position beneath the ram of a 15-ton capacity press, Fig. 6. The press ram is fitted with a guided steel plate to insure vertical movement and an even pressure over the entire plate area.

Having moved the charged lower core-box into the position shown, the operator takes the upper core-box from a conveyor on which it had bypassed the hopper unit, and positions it on top of the lower member. Foolproof dowel-pins insure correct assembly of the halves. The upper member is pressed into the sand-resin mixture under a load of 6 1/2 tons. This force is exerted

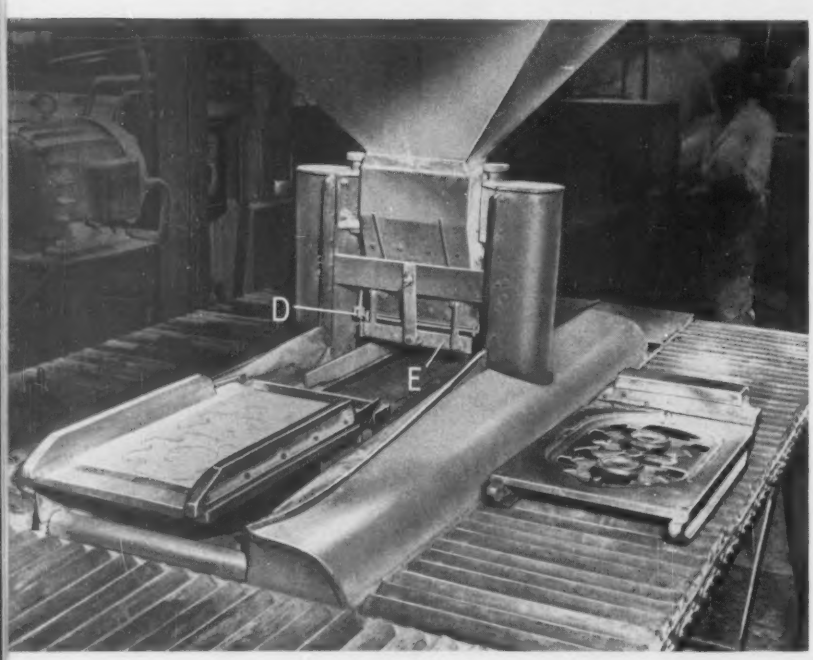


Fig. 5. Filled lower half of core-box is emerging from the rear of the dispensing hopper. Blade (E) sweeps excess sand into trough at one end of stencil plate.

Fig. 6. A 15-ton capacity press is employed to force the upper half of the core-box into the sand-resin mixture contained in the lower half. A pressure of 6 1/2 tons is applied for ten seconds.

for an automatically controlled period of ten seconds, after which the complete assembly is removed. Passage through the curing oven is the next step.

In the two minutes that elapse before emerging from the oven, the core-boxes are again raised to their normal operating temperature of about 200 degrees C. A loss of approximately 40 degrees C. usually occurs from the time the boxes were stripped of their previous cores until they are reloaded and reach the oven once again. As the boxes emerge from the curing oven, they are moved from the furnace conveyor chain belt to the stripping unit seen in Fig. 7. The stripping unit is mounted beneath a steel plate that is machined flat and provided with a pair of L-shaped guides on its upper surface.

As it is slid on the plate, lugs on each side of the lower half of the core-box engage the guides. The operator then moves lever *F* which actuates two hydraulic cylinders 3 inches in diameter mounted beneath the table. Connected to the pistons of these cylinders is a flat plate to which is fastened four cylindrical steel rods *G*. These rods bear against lugs projecting from the corners of the upper half of the core-box, as shown in Fig. 7. This action lifts the upper half of the core-box, which has greater draft on its sides, out of the cured sand-resin core. The core remains in the lower member due to its lesser degree of draft.

Continued movement of the hydraulic cylinder raises two annular members into contact with stripping pins, the ends of which project downward from the under side of the lower core-box. The pins apply pressure against each of the fourteen pattern cores at a point where the material is the thickest. Arrangement of the pins is shown clearly at *H* in Fig. 8. The oven exit and the chain link conveyor may be seen at the right.

After the stripping pins have freed the core, the upper half of the box is removed, cleaned with compressed air, and pushed along the conveyor to the stripping solution spray unit. The completed core is placed on a length of inverted channel iron—one of several forming the top of a bench behind the operator's position. The hydraulic valve is then moved to the return position, the stripping pins and rings being retracted by heavy-duty springs. When this is completed, the lower half of the core-box is once again sent around the core-making unit.

The first core produced from each box, at the beginning of the day, is placed on a separate length of channel iron. Thereafter, the cores placed on each channel are from the same box,

Fig. 7. A hydraulically actuated stripping unit lifts the upper core-box member. Immediately after this, through the action of stripping pins built into the lower core-box member, the cured shell is ejected.

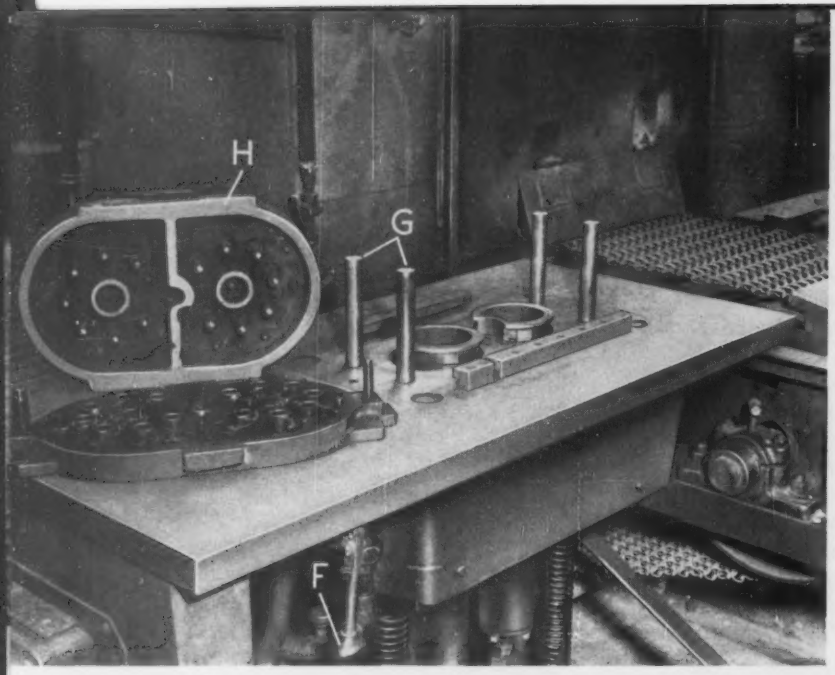


Fig. 8. A view of the stripping unit with the ejectors raised. Rods (G) lift the upper core-box member, and the ring components actuate the stripping pins in lower member (H).

and each mold is built up from cores taken from one channel only. In this way, any slight variations between core-boxes will not affect the final mold assembly.

A set of parts necessary to build up a single mold is shown in Fig. 9. A mold stack is started by placing the runner core on cast-iron plate *J*. This core has a longitudinal channel in its upper surface in which two transverse bars of a sand-resin material have been inserted. The purpose of these bars is to close off about half the runner section on either side of the center sprue so that any slag or other foreign matter that enters the mold will be held back.

On top of the runner core is placed a single-sided core. Two such cores may be seen in Fig. 9 at *K* and *L*, the latter having the correct side up for assembly. Above this core are placed nineteen double-sided cores *M* (Fig. 10), and on top of them another single-sided core *N* of an opposite hand to those at *K* and *L*. All cores have integral locating dowels on one side and matching cavities on the opposite side. Before assembly, the three holes in each core that form the down sprue and the up sprues are cleaned with a file to remove any restrictions to the flow of metal.

A sheet of brown paper is placed between the last shell and an oil-bonded header core shown at *P* in Fig. 9. This header is reinforced by cast frame *R*. Two long studs are used to fasten the mold together before it is taken away to be poured. The purpose of the brown paper is two-fold—it promotes some degree of back pressure in the up sprues, and also prevents foreign

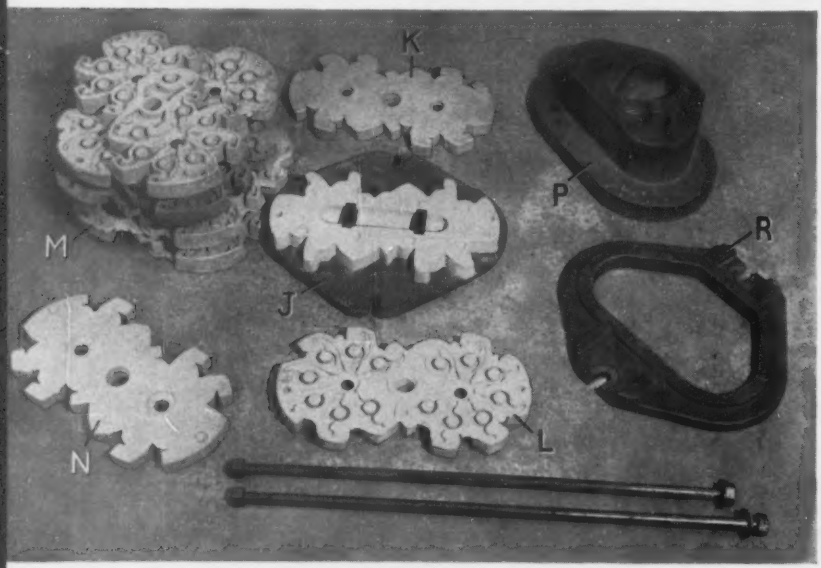


Fig. 9. Various components necessary to build up a complete mold. At (K) and (N) are seen two single-sided cores of opposite hands. Several double-sided cores are shown at (M).

Fig. 10. Cores in each pile are taken from one core-box only. Before the header is fitted, brown paper is placed above the top core to prevent entry of dirt and to build up back pressure.

matter from falling into the molds after assembly and floating up into the casting cavities.

Rocker Arms are Cast, Then Annealed

As many molds as are required for a melt are arranged in rows near an 800-K.V.A., electric arc furnace having a 1-ton capacity. The molds are poured, as shown in the heading illustration, without backing or any further preparation. A 120-pound capacity ladle with lips on both sides (to enable a double row of molds to be poured) is employed. A chain hoist running on an overhead rail supports the weight of the ladle. The molds are so arranged that the ladle can quickly be run from the furnace to any of the pouring positions. Only one mold is poured from each ladle filling.

This system offers the advantage that pouring can be carried out at a fairly constant temperature, ranging between 1428 and 1437 degrees C. A record is kept of the temperatures at which the metal is tapped for each batch of molds, measurements being taken with an immersion pyrometer.

Iron of the following composition is used:

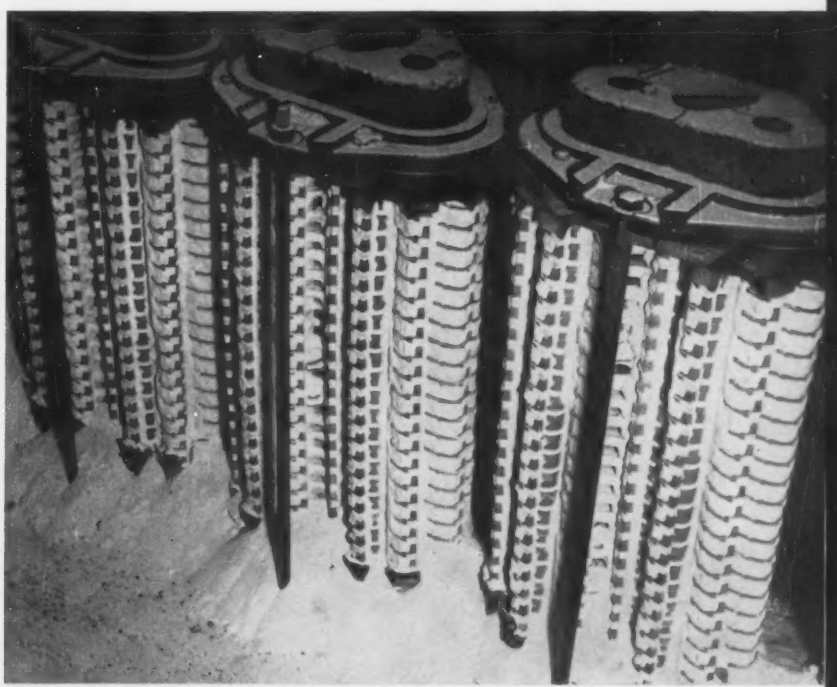


Fig. 11. One hour after pouring, the resin is completely burned out. It is then only necessary to tap the casting in order to remove the sand remaining around the rocker-arm cluster

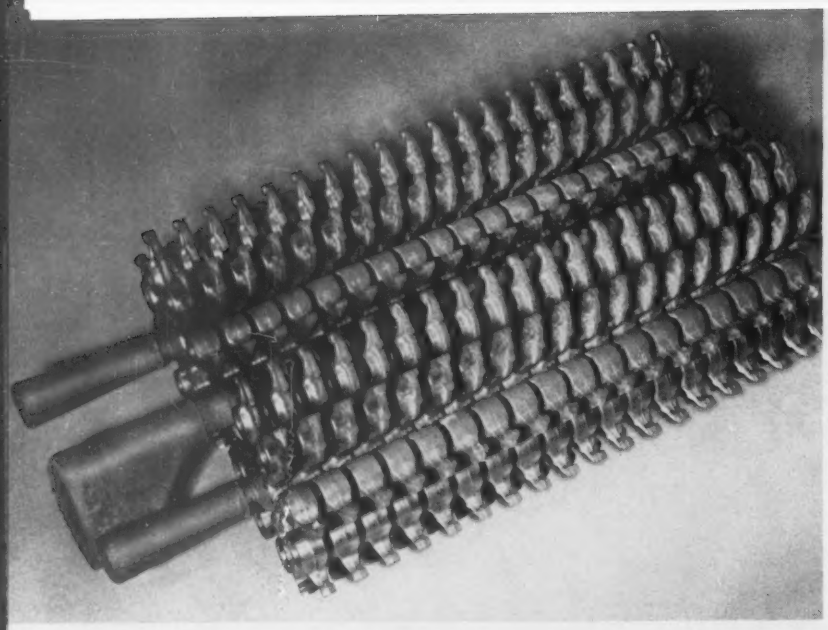
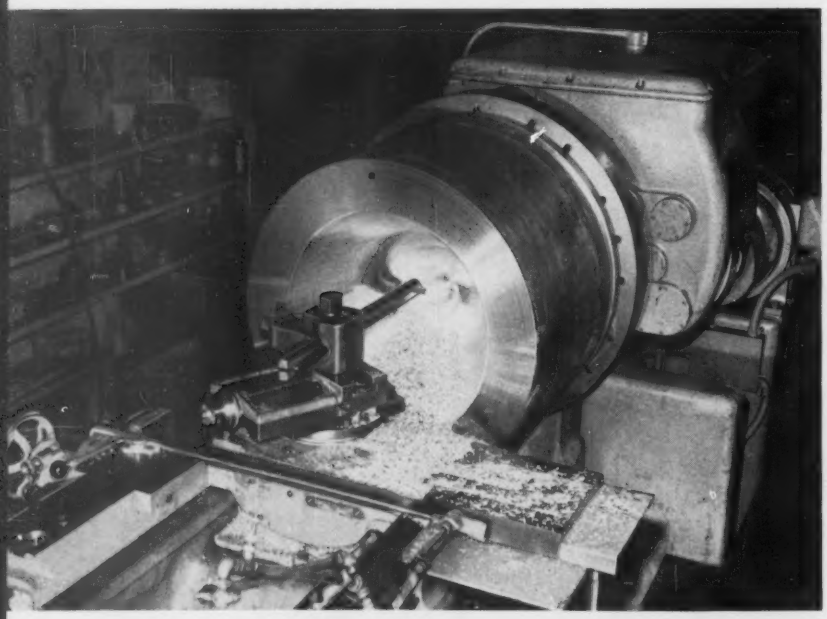


Fig. 12. A cluster of rocker-arm castings as it appears after the sand has been shaken off. A total of 280 castings form this cluster.

Carbon, 2.2 to 2.4 per cent; silicon, 0.85 to 1.1 per cent; manganese, 0.25 to 0.5 per cent; and copper, 1.00 to 1.25 per cent. As the pouring starts, the resin in the molds immediately begins to burn. While the castings cool, the resin loss allows the sand to fall away, so that after about an hour the molds appear as shown in Fig. 11.

The castings are allowed to cool completely before being knocked out, and then it is only necessary to unfasten the bolts and shake off the adhering sand. The appearance of the cluster casting at this stage is illustrated in Fig. 12. Next, the rocker-arm castings are broken from the runner bars and tumbled, following which they are shot-blasted.

Each batch of castings is subsequently bright-annealed to produce a pearlitic malleable structure with a Brinell hardness ranging from 201 to 255. This treatment is carried out in a pit type furnace which is supplied, at the rate of 100 cubic feet per hour, with a special atmosphere containing a maximum of 0.2 per cent carbon dioxide; 17.5 to 20 per cent carbon monoxide; 50 to 55 per cent hydrogen; 0.2 to 1.00 per cent methane; and the remainder, nitrogen. The castings are held at a temperature of 955 degrees C. for six hours, and subsequently, at 745 to 750 degrees C. for an additonal three hours. They are then cooled to 540 degrees C. before being discharged from the furnace.



Machining the cavity in a large Kirksite draw-die on an Axelson 100-inch gap lathe at the El Segundo Plant of Douglas Aircraft Co., Inc. The draw-die weighs over 7000 pounds. Before coming to this machine, the casting was back-faced on a vertical turret lathe. Then, on the Axelson lathe, the die was front-faced and the inside was taper-contoured.

Precision-Finishing Tapered Valve Components

By Donald A. Mackay
Heald Machine Co., Worcester, Mass.

POSITIVE flow control, as applied to the many different fluids in use today, calls for a wide variety of valve types. Most valves designed for this purpose employ either a tapered plug or a wedge which mates with an identically tapered seat in the valve body. This design is embodied in gate valves, globe valves, tilting disc valves, and gas cocks.

Since the effectiveness of any valve depends upon its ability to provide a positive seal when fully closed, specifications generally call for precision-finishing of the mating surfaces. Heald Bore-Matic machines have been successfully set up in a variety of ways to perform these finishing operations. Selection of the machining method, which includes work-holding devices and the tooling, depends upon such factors as type of valve, material, and production requirements. The five set-ups described here illustrate some of these methods.

Gas-cock plugs for oven control thermostats are taper-turned two at a time, as shown in Fig. 1. This particular set-up is a good example of how taper-turning may be accomplished by swiveling the boring heads and holding the work in a rotating fixture. The angular setting of the heads is apparent in the illustration. Normally, 3 degrees is the maximum swivel angle obtainable without special drive arrangements.

The machine is designed to both semi-finish and finish-turn the work in one complete cycle of operation. A semi-finishing cut is taken on the in-feed stroke; and, after the cross-slide advances the tool, a finishing cut is taken on the return stroke. The cross-slide then resets itself for the next cycle. The heavy outline at U in Fig. 2 indicates the tapered surface machined in this set-up. Two parts are machined simultaneously.

Another method of producing tapers on valve components is illustrated in Fig. 3. Valve bodies (left) are held in a rotating finger type fixture, while plugs (right) are rotated in a fixture incorporating a headstock and tailstock arrangement. Interchangeable adapters permit the finishing of parts ranging in size from 2 inches in diameter down to 1/4 inch in diameter. A two-station hydraulic tool-slide moves forward at an angle. This permits the boring and turning of tapers ranging from zero to 10 degrees, depending upon the angular setting of the tool-slides.

After the operator has loaded both stations of the machine, he initiates the cycle by de-

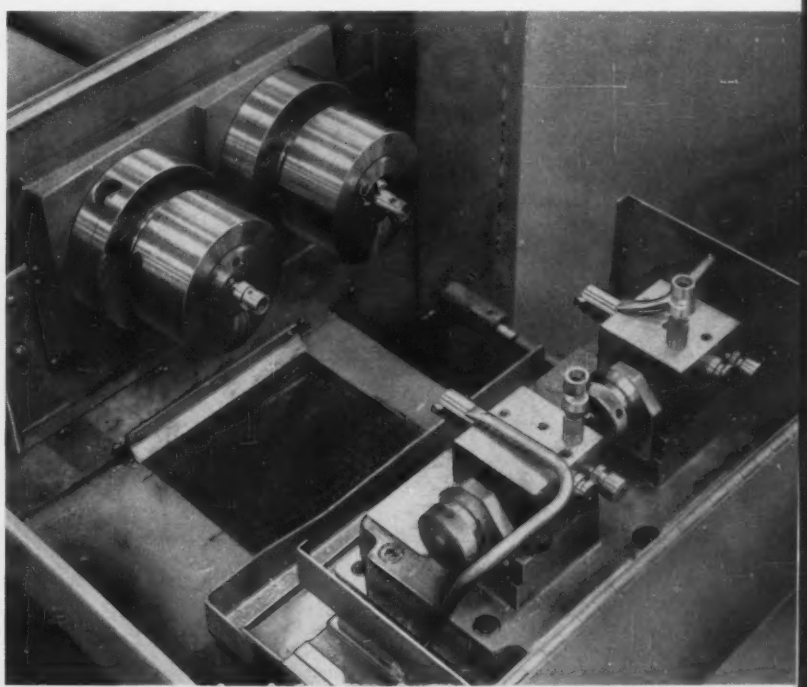


Fig. 1. Two gas-cock plugs are taper-turned simultaneously in this set-up on a Heald Bore-Matic. Both boring heads are set at an angle to obtain the desired taper.

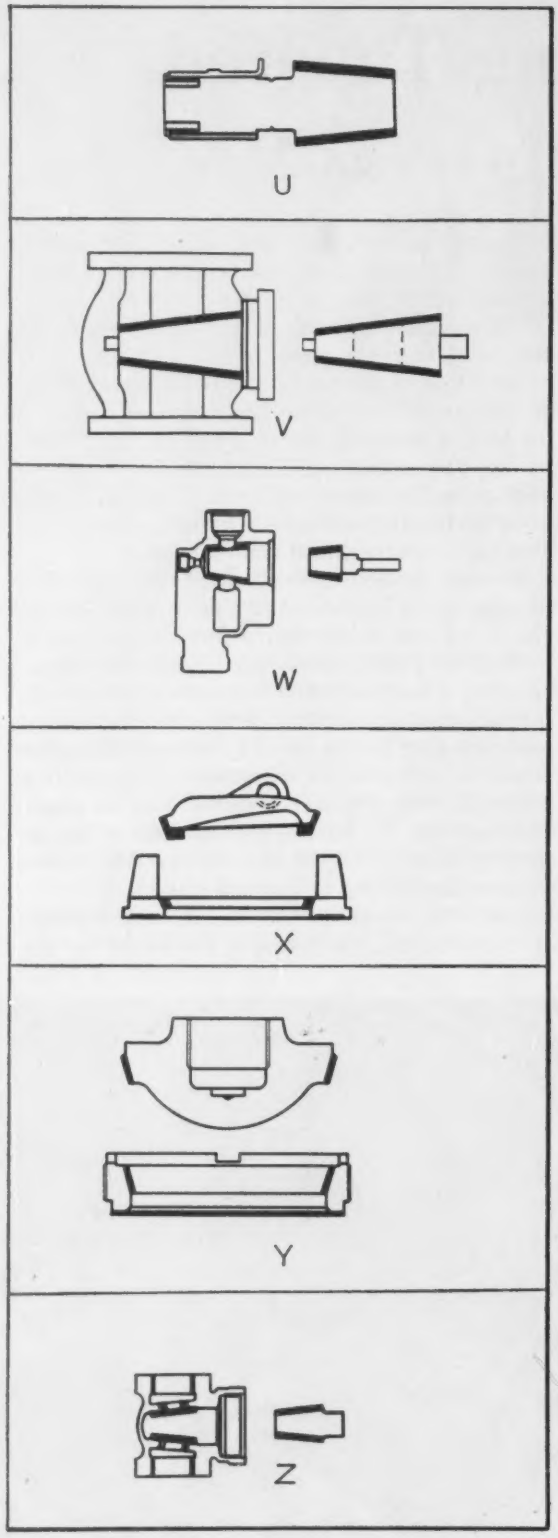


Fig. 2. Surfaces machined in the various set-ups described are represented diagrammatically by heavy outlines. In most cases both male and female members are machined simultaneously.

pressing a button. The table travels toward the rotating work-piece at rapid traverse, slows down, and then stops. At this point, a precision switch starts both tool-slides forward to taper-bore the valve body (front station) and taper-turn the plug (rear station). These cuts are shown diagrammatically at V in Fig. 2. At the end of cutting strokes, precision switches located on the tool-slides are contacted, thus sending the table back to its rest position at rapid traverse. A switch at the rest position causes the tool-slides to reset. A drag line is prevented by reversing the table before resetting the tool-slides.

The two-station set-up on the double-end machine shown in Fig. 4 paved the way to a 30 per cent production increase. This machine will accommodate four different size valves. The adjustable boring-bar, which may be moved back and forth to suit different parts, accounts for its versatility. In this installation, boring heads were swiveled to provide the necessary offset for taper-boring and taper-turning valve bodies and plugs.

Rotating pot type fixtures at the front stations hold the valve bodies while the plugs are held in collet chucks at the rear stations. Heavily outlined surfaces at W in Fig. 2 are those to be bored and turned. Continuous production is made possible by the fact that one set of parts may be loaded at the idle end of the machine while another set is being taper-turned and taper-bored at the opposite end. The operator is protected during loading by a safety release button that prevents the table from reversing until the button is depressed. The cross-slide carries the tooling so that a drag line is prevented.

By the use of adapters, two different sizes of Monel tilting discs together with mating seat rings, and two different sizes of stainless-steel globe valve seat rings together with their mating plugs, may be accommodated in the set-up illustrated in Fig. 5. In addition to taper-boring and taper-turning as shown at X and Y in Fig. 2, faces are also generated on the tilting disc and the globe valve seat ring.

Hydraulically operated tool-slides are mounted on the cross-slide and carry tooling for taper-turning plugs and discs at the front station, and taper-boring seat rings at the rear station. Spacer blocks permit quick and accurate setting of the tool-slides for cutting a taper of 15 degrees on the tilting disc valves and a taper of 20 degrees on the globe valves.

A four-station rotary indexing fixture, loaded with valve bodies, is mounted on the Bore-Matic shown in Fig. 6. Two different style gate valves and their mating wedges can be accommodated by the use of interchangeable adapters which are mounted on the index-plate. The boring heads and the fixture are tilted toward each other to

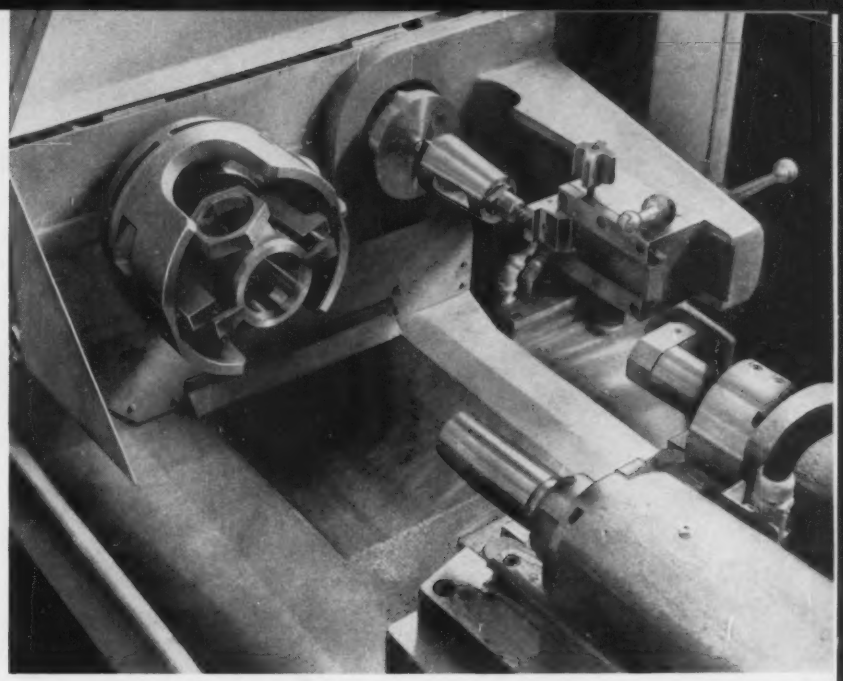


Fig. 3. Valve bodies and plugs are bored and turned at the same time to insure identical tapers. The plug is held in a fixture incorporating a headstock and tailstock arrangement.

provide the correct angle for machining the taper on the work-pieces.

In operation, the fixture first presents the valve bodies to the front boring head, where one side of the waterway is bored, and at the same time the valve seat is back-faced by tooling on a cross-feed unit. The next index is to an idle station between the boring heads. From there, the part is indexed to the rear boring head, where the same operation is performed on the opposite side of the valve. All surfaces finished in this operation are outlined at Z in Fig. 2. While work-pieces are being machined at the front and rear stations, the operator unloads and loads work at the right-hand end of machine.

As soon as the two work stations have completed their boring and facing operations, the table reverses, moving to the right, and the fixture rotates 90 degrees to present two more parts to the boring heads. This machine is end-operated and has a special short table for convenience in loading and unloading. Facing the wedges is performed in a set-up that is similar to the one just described for the bodies.

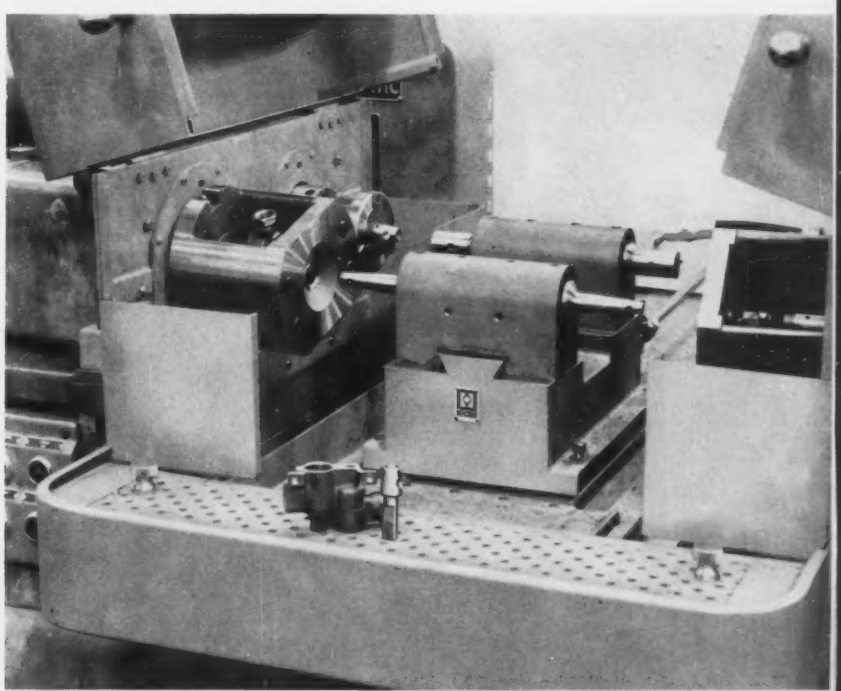


Fig. 4. A double-end machine is used to obtain continuous production of mating tapers on bronze valve bodies and plugs. While one side of the machine is cutting, the opposite side is loaded.

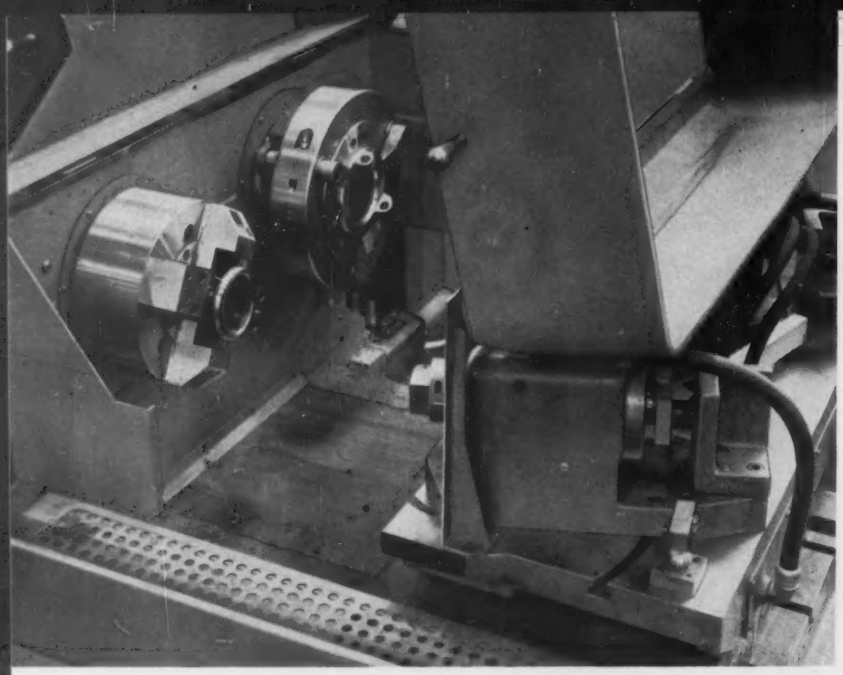


Fig. 5. Tilting discs and mating seats are ready for precision-finishing. By using adapters, globe valve seat rings and plugs may be accommodated. Note the angular adjustment of the tool-slides and spacer blocks.

In these examples, the technique of "borizing" (precision boring) has resulted in greatly improved surface finish and taper accuracy, thus eliminating selective mating of parts. For set-ups which require high production rates, as was the condition in Fig. 4, advantage is taken of a double-end machine, quick-acting fixtures, automatic cycles, and rapid table traverse during noncutting periods of the cycle. A constant-feed throttle on these machines makes it possible for the operator to set and lock the controls for a full day's run, regardless of changes in temperature and the resultant changes in viscosity of the hydraulic fluid in the control system.

Although the jobs outlined here seem to cover a variety of valve types, they should not be considered representative of any general classes of valves. They are described primarily to demonstrate a few of the many ways in which the job may be approached and to emphasize the necessity of attacking each job freshly and originally. In this way, all pertinent factors may be arranged in optimum relationship with each other in order to give the desired results.

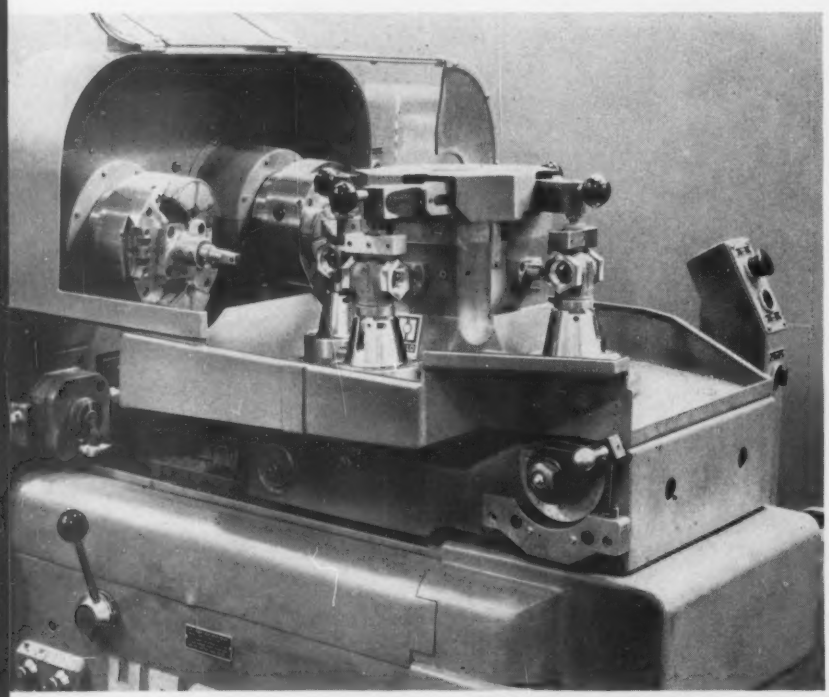


Fig. 6. A rotary indexing fixture presents opposite sides of the valve body to each boring head in turn. As can be seen, there is a slight inclination of the boring heads and the work fixture toward each other.

Performance of Bearing Alloy Improved with Nickel

By alloying the correct percentage of nickel to a white metal bearing alloy, its performance has been greatly improved

DEVELOPMENT of a bearing alloy of a composition that will stand up under rigorous use, and at the same time allow the employment of simple application techniques, has long been the hope of manufacturers and users of heavy-duty processing equipment. It was required that the alloy possess good mechanical properties—be wear-resistant, non-abrasive, and easily bondable. Cost was, naturally, another consideration.

After extensive research and field study, Jackson-Wheeler Metals Service, Inc., Brooklyn, N. Y., found the answer in "Tuftin No. 73 Nickel Alloy." Experience has indicated that with the use of the metallurgically correct quantity of virgin nickel (usually not over 1 per cent) properly alloyed to its Tuftin and Tuftex alloys, the most severe operating conditions can be satisfactorily met. The nickel component imparts to the alloy unusual pressure resistance to withstand heavy loading, toughness to absorb mechanical shock without fracturing, and sufficient heat resistance to maintain hardness while operating at elevated temperatures. In addition, the nickel yields a finer grain and a more uniform structure in the bearing material.

A case history recently released by the B. F. Goodrich Co., Akron, Ohio, is typical. Employing the conventional method of repair on a worn roll-neck bearing liner, company engineers first removed the worn liner from its housing, then machined a new bronze liner on both the inside and outside diameters, and finally pressed it into the bearing housing. All this had to be done before the equipment from which the bearing was removed could be put back into operation. This procedure not only involved the purchase of a new part, but also caused a considerable amount of "down" time while the replacement was being effected. With the Tuftin method, instead of installing a new liner, the worn one was put back in good working order by brazing in the bearing

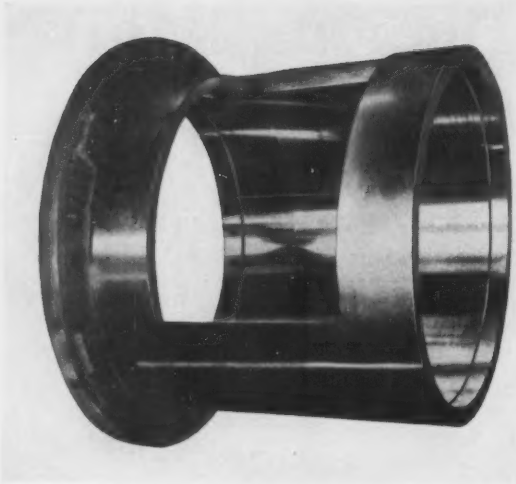


Fig. 1. A worn 15-inch diameter bronze bushing, used on a 60-inch rubber mill roll-neck bearing, shown after being under-cut for relining

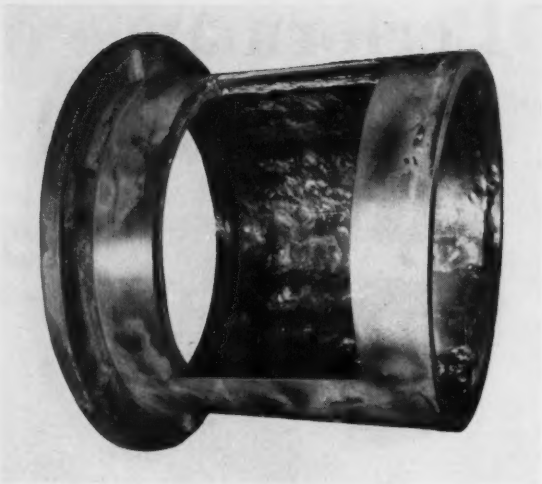


Fig. 2. A layer of bearing alloy, containing nickel, has been built up on the internal surface of the bushing by brazing

alloy containing the correct amount of nickel to build up the bearing surface.

A simple procedure was followed in brazing a new bearing liner. First, V-shaped grooves were machined in the worn bearing surface, Fig. 1, after which the entire surface to be brazed was tinned. A layer of bearing alloy was then built up over the tinned area, as shown in the heading illustration. After completion of this, the bearing housing appeared as may be seen in Fig. 2. The final step in the process consisted of machining the bearing surface, or inside diameter, for size and concentricity, Fig. 3.

When renewing worn bearings that have previously been brazed, the grooving and tinning steps need not be repeated. On the first renewal, Goodrich realized a saving of about 10 per cent in cost of labor and materials. The second and succeeding renewals showed a saving of about 45 per cent.

Due to the inherent stability of Tuftin and Tuftex bearing alloys with nickel, they may be re-used several times with no sacrifice of characteristics. However, in the process of recovering worn liners, and in accumulating trimmings and chips from machining operations, foreign materials inevitably become mixed with the alloys and reduce their serviceability. Therefore, as a part of its complete bearing service, Jackson-Wheeler is set up to receive such accumulations for cleaning, testing, re-alloying, and rebalancing.

In this procedure, all alien materials such as steel, cast iron, bronze, aluminum, zinc, grease, and dirt, are thoroughly removed. The alloy is then laboratory tested and any virgin metal such as nickel, tin, copper, or antimony is added to bring the finished alloy up to original standards. With this service, the user can save from one-half to two-thirds the cost of new material.

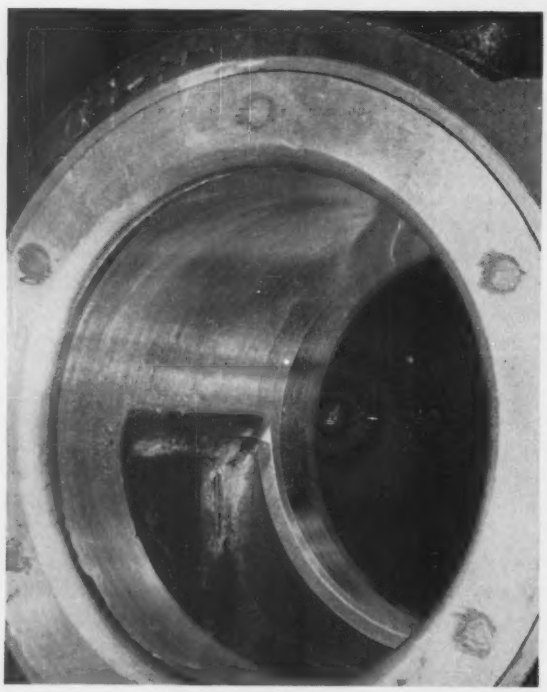
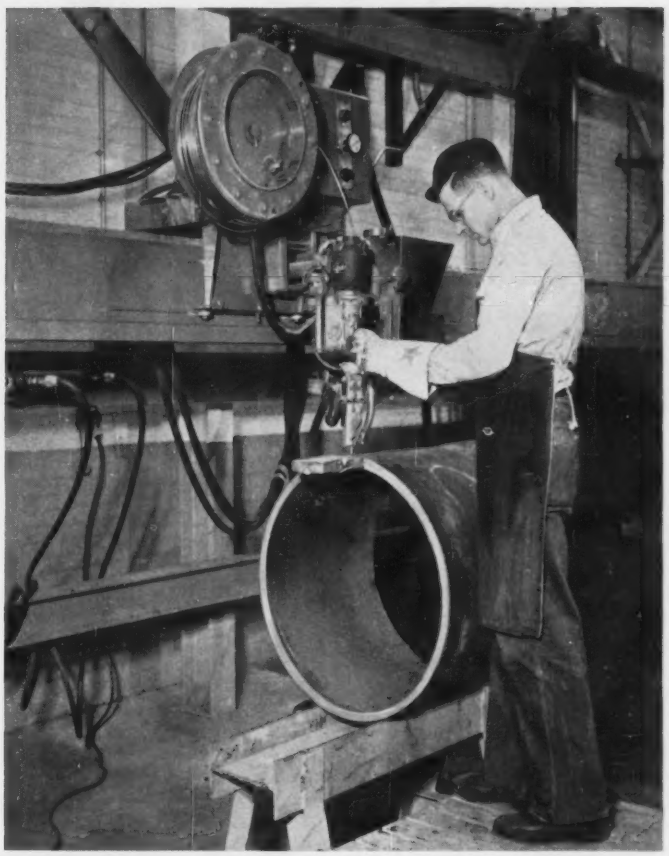


Fig. 3. Machining follows the brazing of bearing alloy on the interior of the housing. After this, the completed bearing is ready for use

* * *

It takes approximately 165,000 tools to build a modern jet powered bomber.

Steel Weldments Replace Castings at Allison



Reduction in machining costs and simplification of balancing influenced the choice of welded armature spiders over steel castings. This arc-welded product not only costs and weighs less, but is also superior to cast-steel spiders on several counts

By Herbert Chase

FOR several years, the Allison Division of the General Motors Corporation, Indianapolis, Ind., has been working in its locomotive parts department to produce weldments that could replace cast components. A primary objective, attained some years ago and now being extended to several locomotive generator components, was to reduce cost without sacrificing the quality of the product.

Initial experiments were made with the cast-steel generator armature spider shown in Fig. 1. The castings were heavy and required considerable machining. In addition, balancing was difficult because the metal distribution was often not uniform. Due to these adverse circumstances, the spider was redesigned to permit fabrication by welding. The weldments are shown, both before and after machining, in Fig. 2.

Longitudinal sections of the two types of parts are illustrated diagrammatically in Fig. 4. The differences in structure of the two units, as well as the lightness of the welded members, are evident. Sections can be thinner, largely because they are made from mild-steel plate of uniform density, which has ample strength to meet all requirements. Since the outer shell and quill are tubular, and the two flanges and end ring are symmetrical about the same axis, weight distribution is uniform and balancing is simplified.

Because the weldment is produced much closer to finished size, there is a considerable reduction in machining, and it is now necessary to insure good welds. Welding problems have been minimized by the application of modern automatic arc-welding methods and equipment in which high-current density insures good penetration and uniform quality along with a high welding speed. Thin walls of uniform density are obtained by the use of rolled plates and bars. As the welded spider is 25 per cent lighter than the cast one, there is a substantial saving in material cost. Lighter machining cuts suffice and the concentricity of the weldment surfaces leads to longer tool life.

Some fillet welds are used, but most of the beads are laid down in grooves formed by cham-

Fig. 1. Cast-steel armature spiders are shown before and after machining. These castings have been superseded by less expensive weldments.

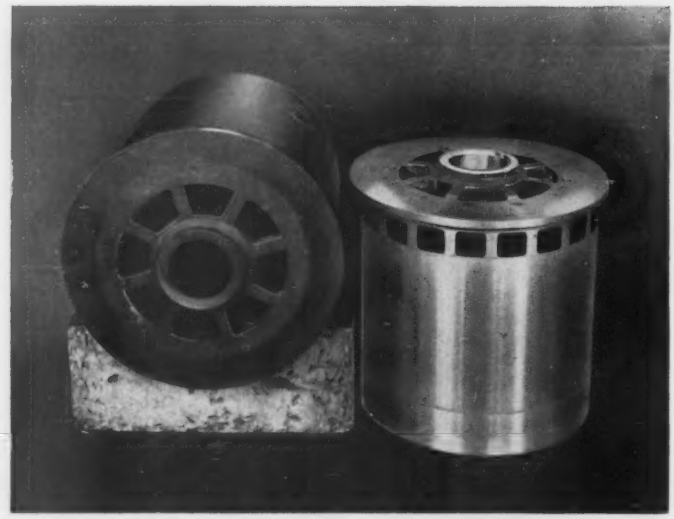


Fig. 2. Armature spider weldments before and after final machining. The rectangular ports located around the periphery of the finish-machined part are flame-cut.

Fig. 3. Joining the ends of a ring formed from bar stock in a 750-K.V.A. flash-welding machine. Two of these rings will subsequently be arc-welded to the open end of a spider shell.

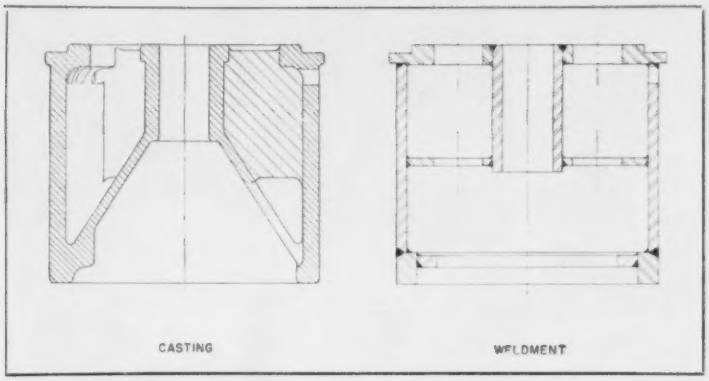


Fig. 4. Longitudinal cross-sections through a cast armature spider and through a weldment produced for the same application. The location of all circular welds is shown.

fers. The necessary grooves are cut in the same set-ups used for other turning operations. Two rings used in the open ends of the weldment are rolled from bar stock. A Federal flash welder of 750-K.V.A. capacity, Fig. 3, is employed to form the ring joints.

Both the front flange and the diaphragm that supports the inner end of the quill are flame-cut from plate stock in magnetic tracer-controlled machines. This work includes cutting out a central hole and eight access holes in each piece. Chamfers are machined on these components where needed.

The body shell is rolled to shape from 1 1/8-inch thick plate stock, as seen in Fig. 5. It is then tack-welded and run-out strips are hand-welded in place at both ends of the seam. Following this, the shell is placed under a Lincolnweld automatic head, as shown in the heading illustration. This hidden-arc set-up, using 3/16-inch diameter electrode wire and granular flux, completes the weld in two passes. Each pass feeds at the rate of 15 inches a minute, using a current of 950 amperes.

When inspection of the welds has been completed, the shells are stress-relieved, if required, and delivered to a 270-ton hydraulic expanding press, Fig. 6. Here they are sized to maintain necessary limits on the inside and outside diameters, and to maintain stock thickness uniformity. End scarfing for the weld beads is done on an engine lathe.

After a circular end plate has been tack-welded to the shell, the unit is mounted on an inclined positioner, Fig. 7, which is located under the same Lincolnweld automatic head previously used for welding the longitudinal shell seam. In this case, however, the head remains stationary while the work is rotated slowly. The rate of ro-

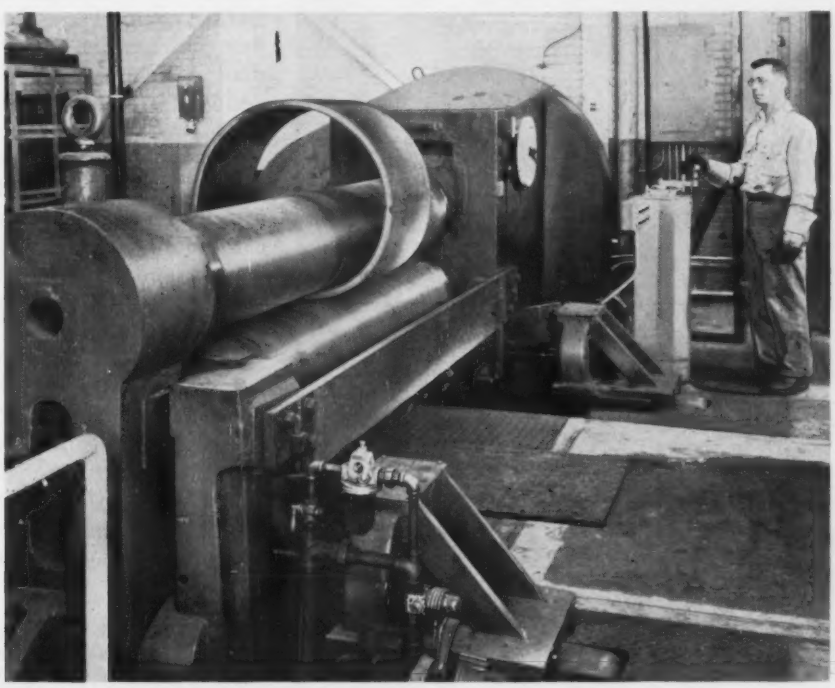


Fig. 5. A steel plate, 1 1/8 inches thick, is being rolled to form the body shell for an armature spider. Joint is later hidden-arc welded in an automatic set-up.

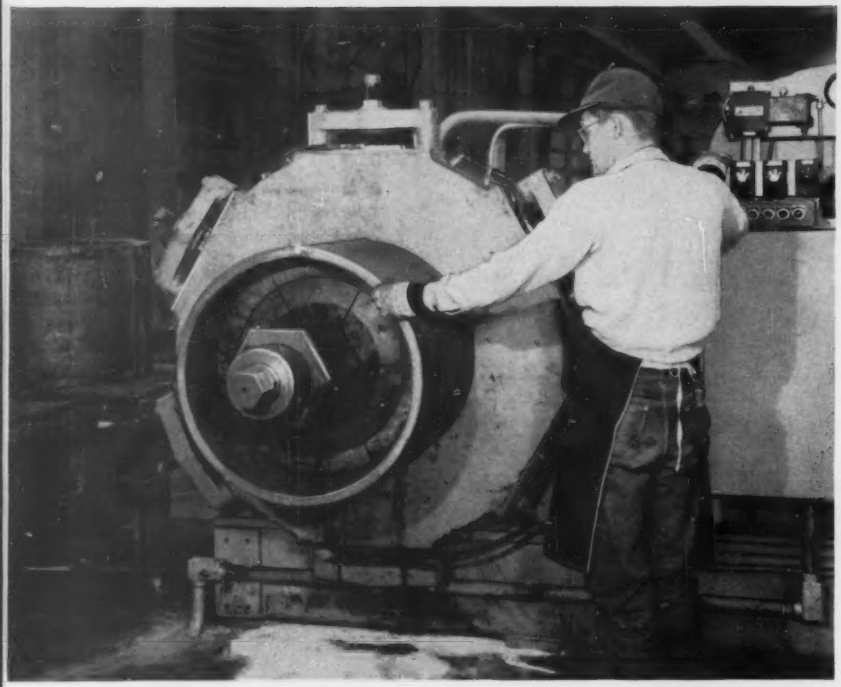
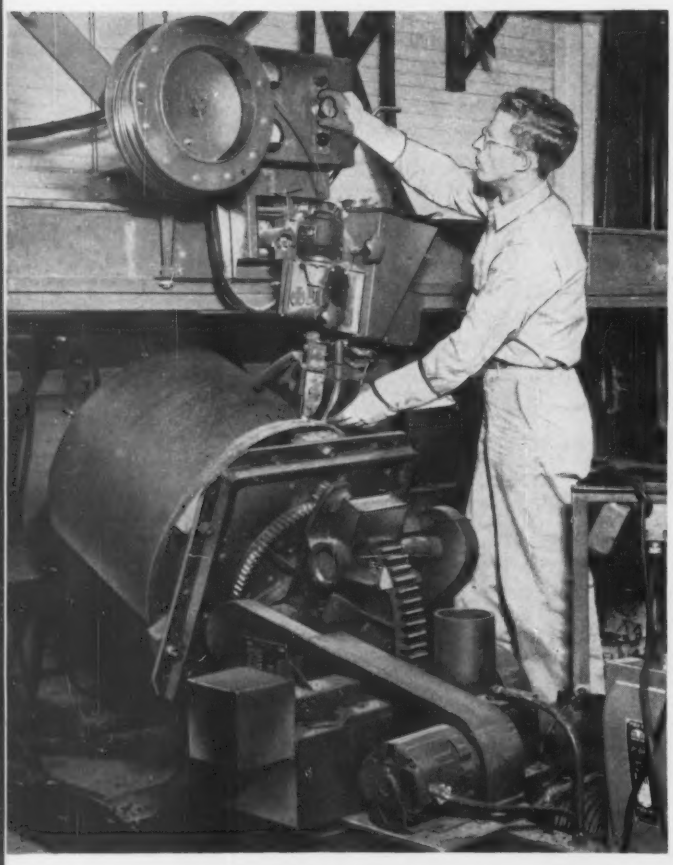


Fig. 6. After making the longitudinal weld, the shell is sized on this hydraulic expanding press to maintain the required close dimensional limits.



tation is set to yield maximum density in the weld bead. It is laid down in two passes at the rate of approximately 12 inches a minute.

By inclining the work, the electrode reaches well into the groove formed by the end chamfer on the shell, and flux is retained by the flange. In this, as in other automatic welding operations, flux that has not been fused is collected and reused after screening. Fused flux chips off easily and leaves the weld clean, ready for inspection.

This same set-up is employed to make the outer weld that joins the bottom ring to the open end of the shell. For this operation, the axis of rotation of the positioner is set horizontal because both the shell and the ring are chamfered equally and the electrode is in a vertical position. Several other circumferential welds are made by the same head, but it cannot be used for all interior welds due to inaccessibility of the seams.

Welds that cannot be handled by the automatic machine are made by manual arc methods, as shown in Fig. 8. In making the small fillet type welds around the inner face of the diaphragm, the operator has to work through access holes. These welds are not especially difficult, however,

Fig. 7. Spider shell and head plate are joined by an automatic hidden-arc welding head that remains stationary while the shell is rotated slowly on a positioner.

Fig. 8. Hand arc-welding interior spider components that are not accessible to automatic welding heads. Operator at left works through access holes.

since the access holes are large and afford adequate space and visibility as the work proceeds.

Air vent ports are not cut in the shell until it is joined to the end plate. The ports, of which there are thirty, are flame-cut in the set-up illustrated in Fig. 9. The shell rests on rollers so that it can be indexed between holes. Included in the set-up is an automatic horizontal drilling unit that drills starting holes for the flame of the cutting head. The head is located above the shell and is moved by a magnetic tracing device. Cutting is repeated after each indexing until all the ports are finished. Before final machining, the weldments are stress-relieved.

* * *

New Automatic Sound Slide Films

Two technical automatic sound slide films have been released by the Sheffield Corporation, Dayton, Ohio. "Machining the Unmachinable" deals with the Cavitron process, which utilizes ultrasonic energy for machining the hardest materials known. "New Horizons for Quality" pictures the application of Plunjet, an air gaging cartridge which has many uses.

Fig. 9. Indexing set-up in which a partially completed spider has ventilating ports flame-cut after starting holes are produced by the drill at the lower right

Materials OF INDUSTRY

The properties and new applications of materials used in the mechanical industries

Brazing Alloys and Flux Provide Strong Ductile Joints

A complete line of silver brazing alloys and a flux for all types of production jobs have been announced by the Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y. The Aircosil alloys, as they are called, are available in various forms —rod, wire, sheet, rings, and gaskets— as well as special shapes. Aircosil flux is available in paste form and will not freeze, crystallize, or separate. The residue rinses off easily in hot water.

The penetrating action of these materials is fast, which results in the formation of a small, neat fillet left outside the joint. Bonds are liquid and gas-tight under high pressures, and are strong and ductile, withstanding shock, vibration, and wide temperature changes. High thermal and electrical conductivity in addition to high corrosion resistance are other features. These materials will join practically all ferrous, non-ferrous, and dissimilar metals and alloys that have melting points above the free-flowing temperatures of Aircosil alloys.

Drill Blanks Available In Seven Tolerance Ranges

Drill blanks in six tolerance ranges other than the regular unground condition have been made available by the Hayden Twist Drill Co., 8626 Lyndon Ave., Detroit 38, Michigan. The tolerance ranges are as close as +0.00002 inch —0.00000 and as wide as +0.0000 —0.0005 inch. Drill blanks are used to make gages, test bars, dowels, pivots, radius gages, tool bits, drills, and end-mills.

Titanium Fasteners Now Available in Production Quantities

Camcar Screw & Mfg. Corporation, 629 Eighteenth Ave., Rockford, Ill., has made available standard and special titanium fasteners in production quantities. These fasteners are made from titanium alloy RC 130B wire, composed of 92 per cent titanium, 4 per cent aluminum, and 4 per cent manganese. Parts made from this material have a minimum tensile strength of 150,000 pounds per square inch, and a minimum shear strength of 95,000 pounds per square inch.

Because of the weight-saving possibilities, fasteners made from titanium are of particular interest to builders of airframes, engines, and accessories. This material also offers advantages in marine and chemical applications because of its good corrosion resistance.

All-Purpose Steel Bar for Maintenance Use

For easy maintenance, the LaSalle Steel Co., 1412-150th St., Hammond, Ind., has made available "Stressproof" steel bars which can be easily machined and which have the strength and wearability of practically any alloy or heat-treated carbon steel bar.

Instead of attempting to stock a range of different steels, maintenance departments can keep their bar inventory to a minimum, and still be able to handle practically any repair job, by stocking a few sizes of this all-purpose bar. Round bars are available from 3/8 inch through 3 1/4 inches, and hexagonal bars from 3/8 inch through 2 inches.

Greaseless and Binderless Flux Reduces Cleaning Time

A greaseless and binderless flux used for joining copper tubing that eliminates the necessity of prior steel wool cleaning of joints to be soldered has been developed by the American Solder & Flux Co., 19th and Willard Sts., Philadelphia 40, Pa. "C-Flux" tins the metal as it cleans, permitting solder to flow smoothly with deep penetration. Use of this flux is also said to be advantageous because of easy cleaning of residues.

Casehardening Compound Eliminates Dangers of Fumes

A casehardening compound developed to replace cyanide, and thereby eliminate poisonous fumes, provides a simple method for the quick-surface hardening of steel tools, dies, parts, and cutting implements. The compound, which is

called "Royal" hardening powder, is applied to areas heated to a temperature of from 1400 to 1700 degrees F., and the heat maintained for fifteen to thirty minutes. The part is then quenched for desired temper. A case depth of 0.01 to 0.02 inch is said to result. This compound has been made available by the Anti-Borax Compound Co., Inc., 1506 Wall St., Fort Wayne 6, Ind.

Paste Solder for Sweat Soldering and Tinning

A solder paste for sweat soldering or tinning has been brought out by Alpha Metals, Inc., 56 Water St., Jersey City 4, N. J. "SweTite" paste solder, as this material is called, is a half-and-half blend of powdered solder and an active flux. For most applications, cleaning is unnecessary. The paste is applied with a brush or a cloth, the parts are fitted together, and heat is applied. Any flux residue can easily be removed with a damp cloth. Joints obtained by this method are as strong as those obtained by conventional methods using a separate flux and solid wire.

Rubber-Base Black Paint that Resists Abrasion

A black corrosion-resistant paint that looks like patent leather and has a rubbery feel, is being manufactured by Alfred Hague & Co., 227–34th St., Brooklyn 32, N. Y. Rubalt "RA", as it is known, is a combination of chlorinated natural rubber and bitumen together with modifiers and appropriate solvents.

This paint is non-porous and flexible, and has good adhesive properties. It resists the action of many acids and alkalies, and requires no primer or pre-treatment. The paint will cover 756 square feet of surface per gallon applied in a thickness of 0.001 inch.

Pre-Plating Electrocleaning Material for Brass and Copper

An electrocleaning material that reduces the tarnishing of copper and its alloys in the high-temperature cleaning ranges, or where long treating cycles or prolonged transfer periods may occur, has been placed on the market by Oakite Products, Inc., 126 Rector St., New York 6, N. Y. Oakite Composition No. 191, as it is called, is a free-flowing, fast-dissolving granular product solutions of which are colorless and practically odorless. Among the advantages claimed for this material are: a long solution life; a broad current-density range; and a wide temperature range, 160 degrees to 210 degrees F. It cleans at low concentrations, removes buffing dirt and other common soils rapidly, and is rinsable in hot or cold water.

All-Purpose Sealing Compound that is Easy to Use

Presstite Engineering Co., 3798 Chouteau Ave., St. Louis 10, Mo., has added a white mastic sealer to its line of light-colored, non-staining, non-hardening, and odorless sealers. The sealer, No. 576.1 Permagum, is extruded in handy beads, tapes, and ribbons that can easily be thumbed into slots, holes, crevices, and cracks to seal against water, vapor, dust, or air.

The sealer can be painted over immediately. It will not flow or run at 350 degrees F., will not harden at 200 degrees F., is unaffected by paint baking temperatures, and will not become brittle or lose adhesion at minus 20 degrees F. This compound is particularly useful in the automotive, refrigeration, and air-conditioning industries. Beads are available as small as 1/8 inch in diameter and tapes as thin as 1/16 inch and as narrow as 1/2 inch.

Vapor Degreasing Solvent in Tank Truck Quantities

An improved Triclene D, a trichlorethylene vapor degreasing solvent, has been announced by the Electrochemicals Department, E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Del. This solvent has been developed to resist all the major causes of solvent breakdown, one of which is the attack from light-metal chlorides. It is resistant to the effects of light, air, heat, and acidic materials, and contains no elements that tend to harm or stain the work it cleans. The solvent retains its stability after repeated distillations, and may be used in small vapor units removing mineral oil as well as multiple-compartment conveyorized degreasers. Tank truck quantities are available to users capable of storing large amounts in their plants, with the subsequent savings.

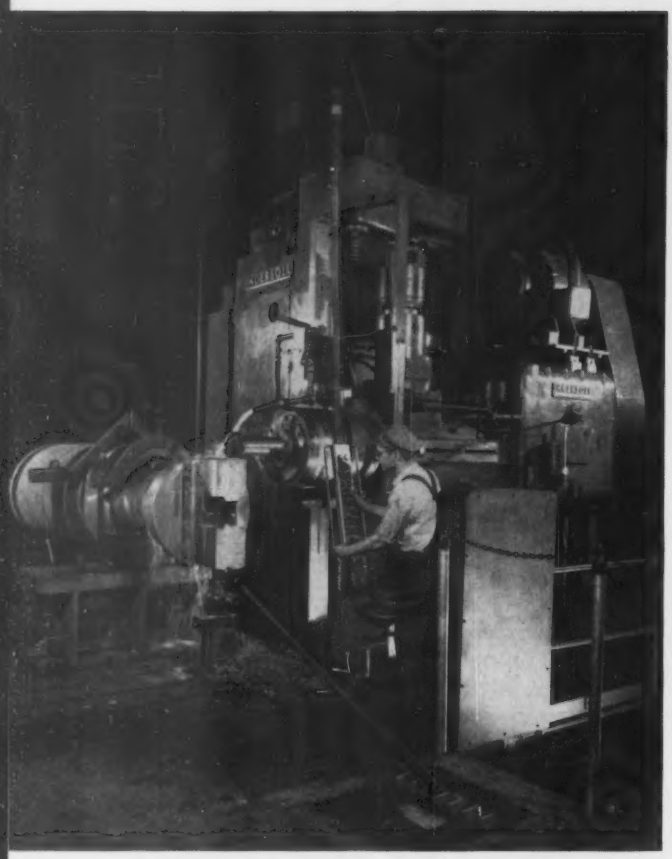
Extremely Hard Iron Alloy that is Abrasion-Resistant

An extremely hard, abrasion-resistant iron alloy capable of being heat-treated to 700 Brinell and developed to resist abrasion, has been announced by the Taylor-Wharton Iron & Steel Co., High Bridge, N. J. Equipment and parts made from Tisco 150-Y, as this alloy is named, have a long life, which leads to economical operation.

Typical applications include blades for the propulsion of blasting grit and steel shot in airless centrifugal blast-cleaning equipment; tube elbows in pneumatic metal-chip handling systems in automotive plants; and production equipment in plants processing roofing material, wall-board, and carton stock from crude scrap containing tramp iron, sand, and other abrasive matter.

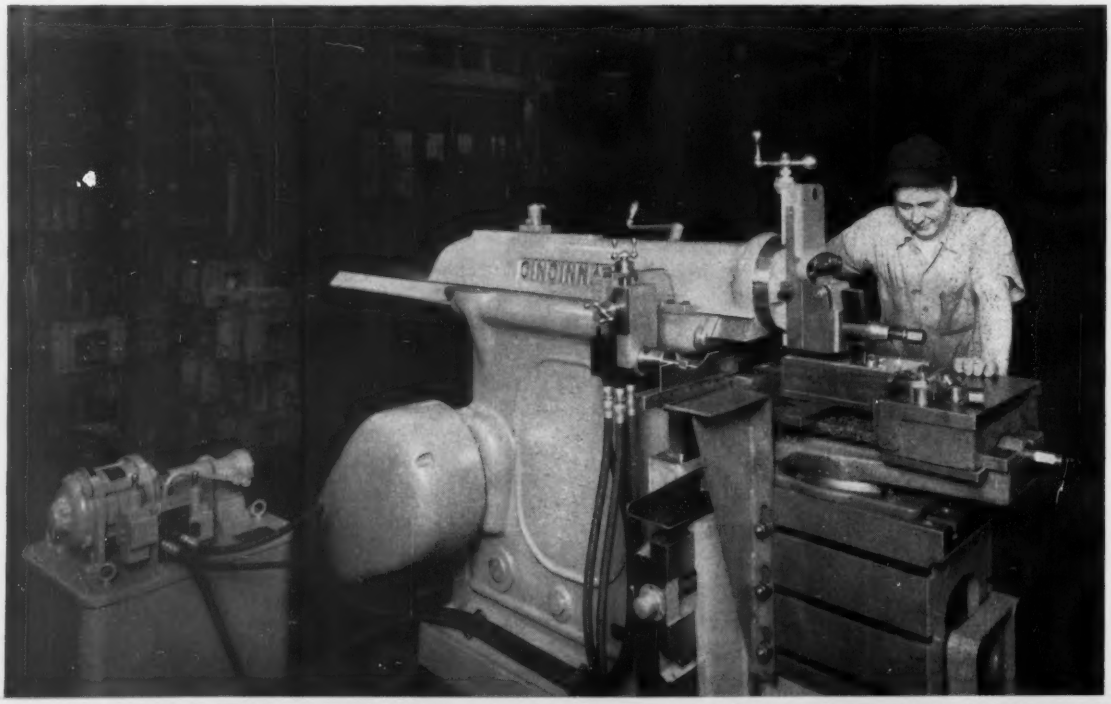
In Shops Around the Country

Camera highlights of some interesting operations performed in various metal-working plants throughout the nation

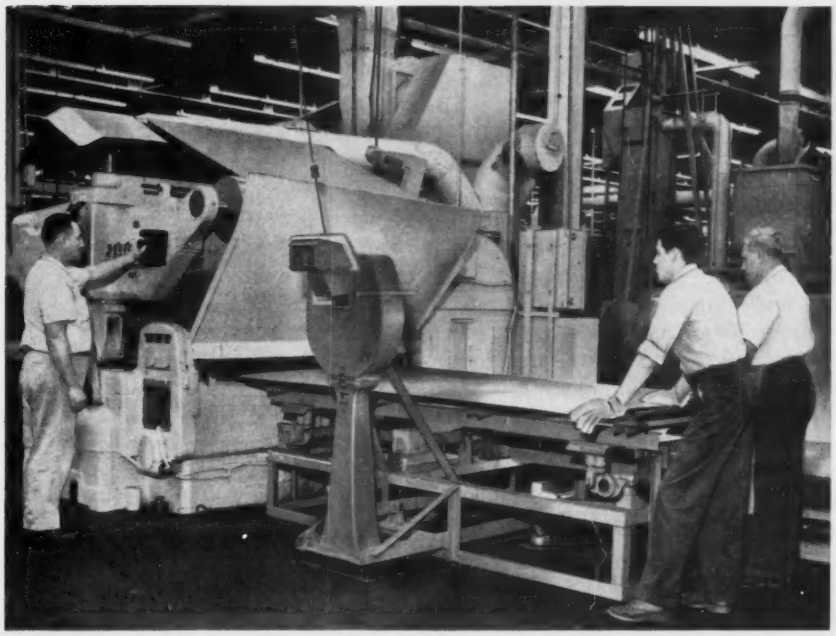


Slab-milling the universal coupling of a 14-foot blooming mill roll, at the MacIntosh-Hemphill Co.'s steel foundry, Midland, Pa. The tough, high-alloy cast-steel roll weighs 40,000 pounds and is 14 feet long and 34 inches in diameter. The Ingersoll horizontal milling machine on which the operation is performed has a quill measuring 22 inches in diameter. Resting on a concrete foundation 11 feet deep, the machine is 12 feet high and weighs 60 tons.

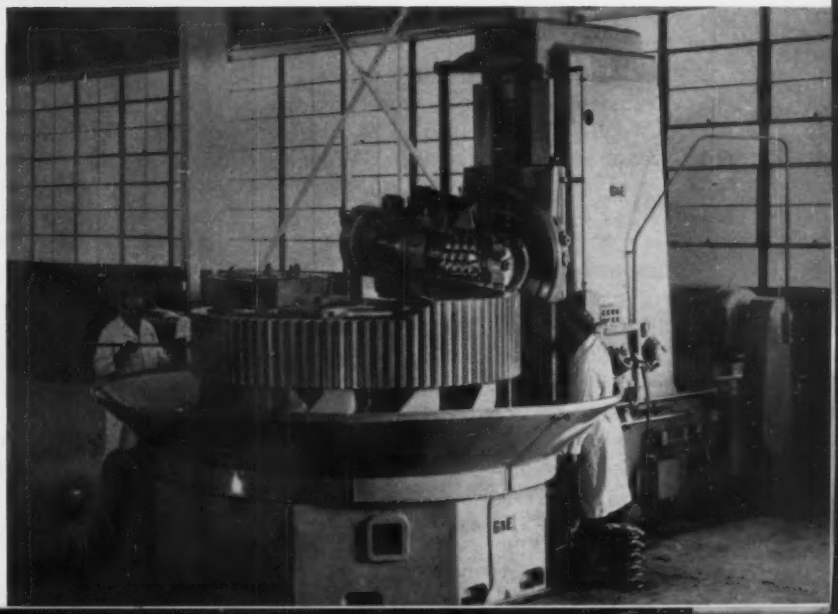
This Cincinnati shaper equipped with a Turchan automatic follower attachment machines bearing plates for highway bridges at the Ernst Iron Works, Buffalo, N. Y. In a twenty-minute floor-to-floor operation, the shaper completes a radial bearing seat which formerly took seventy-five minutes and required two set-ups.



Two Carboloy permanent magnets enable this welding operator at Hart & Cooley Mfg. Co., Holland, Mich., to "square up" frame sections on short-run jobs three times faster than previously by dispensing with clamps and fixtures. The sections come to the resistance welder already mitered, and are located against non-magnetic guide bars. A small triangle is then spot-welded over the joint.



Automatic reciprocating abrasive-belt pinch-roll equipment grinds steel sheets for hollow propeller blades at Hamilton Standard, Division of United Aircraft Corporation, Windsor Locks, Conn. Average sheet weighs approximately 65 1/2 pounds and requires 0.002-inch stock removal to eliminate mill variations in thickness. After a sheet is placed on the table and weighed, the required number of passes are determined. A photo electric cell reverses the pinch rolls after each pass, and sheet is ejected after the passes are made.



A Gould & Eberhardt heavy-duty gear hobber, one of the largest machines of its kind, cuts a press spur gear at the Illinois Gear & Machine Co., Chicago, Ill. The equipment has a capacity for gears of 132 inches in pitch diameter. Spur, helical, and worm gears can be hobbed to within 0.0003-inch maximum tooth spacing error and 0.001-inch tooth parallelism. Huge ground hobs, having a 12-inch diameter and a 15-inch face, are used on the machine.

Tests Establish Strength Factors in Threaded Assemblies

A condensation of a paper on the influence of tap-drill size and length of engagement upon the strength of tapped holes, presented at Annual Meeting of American Society of Mechanical Engineers

By C. J. Oxford, Jr., Research Engineer
National Twist Drill & Tool Co., Rochester, Mich.
and
J. A. Cook, Research Engineer
National Machine Products Co., Utica, Mich.

THE influence of tap-drill size (minor diameter) upon the strength of threaded assemblies has been the subject of much speculation, analysis, and testing, but generally the results presented either have been inconclusive or have not covered all of the many possible types of thread failure. Failures can be of three types: breakage of the external thread member; stripping of the external thread; or stripping of the internal thread. This paper reports the results of a series of correlative tests and supporting analyses undertaken to solve the problem.

Since the adoption of the Unified Screw Thread Standards in 1948 and their increased application currently in industry, the question of the influence of tap-drill size (minor diameter) upon the strength of tapped holes has been raised anew. In the interest of maximum strength, the product designer is often tempted to specify high percentages of thread height in tapped holes. On the other hand, these higher percentages of thread height require higher tapping torques and cause more frequent tap breakage, so the production engineer favors the minimum percentage of thread height, especially when high-strength materials are involved. Furthermore, it has been suggested that some new non-standard tap-drill sizes would be required to permit development of maximum strength in screw-threaded fastenings.

Experimental Procedure

A research program to examine the phenomenon of tapped hole thread height grew out of the intrinsic interest of the National Twist Drill & Tool Co., Rochester, Mich., and the National Machine Products Co., Utica, Mich. It was decided that several combinations of materials would be examined, and that experimentation would be required to check any theoretical analysis. Accordingly, externally threaded members were made of hardened high-speed steel, hardened AISI C-1137 or AISI C-1040 steel, and soft AISI B-1113 steel. Parts with internal threads were made of hardened AISI C-1137 steel, soft AISI B-1113 steel, and gray cast-iron.

Two diameters with both coarse and fine threads on each were used: 3/8–16 UNC, 3/8–24 UNF, 5/8–11 UNC, and 5/8–18 UNF. Eight different percentages of thread height were checked, ranging from 25 to 95 per cent, in 10 per cent steps. In most cases, the length of engagement was equal to the height of a standard nut—slightly less than one major diameter. In addition, on one size, 3/8–24 UNF, a series of tests were run with both variable percentages of thread height and variable lengths of engagement. Nearly 500 pairs of specimens were tested.

Special care was taken in preparing the internal thread specimens to assure squareness. The surfaces were ground parallel, the holes were drilled carefully and reamed to size, and the threads were produced on a lead-screw tapper, being gaged to Class 3B limits. The blanks were at least 1 inch in diameter for the 3/8-inch taps, and 1 1/2 inches for the 5/8-inch taps, to minimize any distortion of the blanks themselves during the strength tests. In order to eliminate another variable, the holes were not chamfered; thus the effective length of engagement was substantially equal to the thickness of the blank.

External thread specimens were made with ground major diameters and ground threads. Minor diameters were carefully held very close to the basic value, well within the allowable limits of the standards. Major diameters were held from basic value to 0.001 inch under size, and pitch diameters were held to Class 3A limits. Ground threads were selected because they offered the best dimensional control, particularly

with regard to lead error on the hardened steels. (It was recognized, however, that rolled threads in some cases would give evidence of slightly higher strength.)

All of the tests were conducted by pulling the external thread through the mating blank, except in the case of hardened high-speed steel external threads, which were pushed. The push test for these specimens, which is somewhat easier to perform, was adopted when a comparison of both push and pull tests showed identical results. With softer materials, the push test was not feasible because of transverse expansion of the external thread. The investigation was based essentially on static loading, in conformity to most common usage. Therefore, conclusions should not be applied indiscriminately to assemblies subject to severe vibration, unless confirmed further.

Results of Tests

With both thread elements of soft steel (AISI B-1113), the failure was produced in the external thread. Failure was by stripping in line with the internal thread minor diameter up to about 50 per cent thread height, while breakage of the external thread member occurred at higher percentages. The fine-pitch threads developed slightly higher loads, as would be expected, because of their greater tensile-stress areas. Substantially, the same types of failure at the same points were observed in testing moderately hard (AISI C-1137) external and internal elements.

Where a moderately hard (AISI C-1040) external thread was tested with both soft (AISI B-1113) and moderately hard (AISI C-1137) internal threads, slightly higher strengths were developed with the soft internal threads than with the heat-treated ones. Again with these combinations, maximum strength was obtained at about 50 per cent of thread height. Failure load points which were almost identical were obtained in testing soft steel (AISI B-1113) external threads with gray cast-iron internal threads.

The foregoing clearly indicates that the maximum strengths of all of the combinations tested were developed at approximately 50 per cent thread height, regardless of the relative strengths of the materials from which each element was fabricated. However, the relative strengths of materials did influence the type of failure. Most often, the maximum strength failure was by breakage of the external thread member, but if the strength of the external thread material was very much greater than that of the internal, failure took the form of stripping of the internal thread.

The tests supported the conclusions drawn by other investigators that a 65 per cent thread height is adequate for the majority of threaded assemblies, subject to the limitation that the effective length of engagement be at least 85 per cent of the major diameter. The effect of reduced percentage of thread height on tapping torque should be noted here also. In a recent publication, the Metal Cutting Tool Institute reported that a reduction of thread height from 75 to 65 per cent on a 3/8–16 UNC thread reduced tapping torque in various types of steel by 28 to 45 per cent.

Influence of Internal Thread Minor Diameter

Drilled-hole size depends on the nominal size of the drill, centrality of the drill web, accuracy of the drill point, material drilled, coolant used, condition and accuracy of the drilling spindle, rigidity of the drilling machine and work-holding fixtures, alignment, and use of a drill bushing—to name the most obvious factors. Even when reasonable care is taken, the variation in drilled-hole size can be significant.

Another complicating factor is the tapering, or bell-mouthing, of the drilled hole, a condition which usually is encountered to some degree. The taper commonly extends for one-half to one diameter from the start of the hole. It is caused by the instability of the drill point during entry into the material, coupled with the normal torsional and transverse flexibility of the drill. Accurate drill sharpening and rigid, well-aligned, close-fitting drill bushings will minimize bell-mouthing. When tapped, such holes will have a variable percentage of thread height along the length of the hole. This variation may be significant in the case of short lengths of engagement and fine pitches.

Although the range of over size is generally less than 2 per cent of the nominal hole diameter, the effect on percentage of thread height is much greater, particularly with the fine and extra-fine thread series. Double nominal thread height can be as low as 9.3 per cent of nominal diameter for the fine-thread series, and 6.5 per cent of nominal diameter for the extra fine-thread series, considering only sizes under 1 inch diameter.

Another factor, not encountered in the tests but common in some materials, is the cold flow of the metal during tapping, which acts to reduce the effective minor diameter of the tapped hole. This is very hard to predict, since it is somewhat dependent on the sharpness of the tap and the chip load per tooth of the tap. The obvious conclusion from this discussion of the size of drilled holes is that if for any reason the percentage of thread height must be controlled to precise limits, the hole should be finished by reaming, boring, or some other precision sizing operation.

Effect of Length of Engagement

It was shown that for standard lengths of engagement (slightly less than one diameter), screw-threaded fastenings failed by breakage of the external thread member, unless the external thread material was of very much greater strength than the internal thread material, or unless the percentage of thread height was very low. A high-strength external thread caused stripping of the internal thread, and low percentages of thread height usually yielded failure by stripping of the external thread. The latter condition suggested that for shorter lengths of engagement, failure by external thread stripping would occur at higher percentages of thread height. If this were to occur, the effect of tap-drill size on strength of the assembly could become significant because of the relatively large variations in effective thread height obtained.

To explore this possibility, another set of 3/8–24 UNF-3 specimens was prepared with thicknesses of 100, 75, 50, and 25 per cent of the 0.3125-inch thickness of a standard nut. The minor diameter was varied to give thread heights from 25 to 85 per cent, in 10 per cent steps for each thickness. Both internal and external thread specimens were made from AISI B-1113 steel of approximately equal hardness.

The failure with the full nut-height internal thread specimens was as would be expected. Stripping of the external thread occurred at 25 to 35 per cent thread height, with breakage of the external thread starting at 45 per cent thread height. With the 75 per cent nut height, stripping of the external thread was encountered up to 65 per cent thread height. The 50 per cent and 25 per cent nut height specimens caused failure of the external thread by stripping at all percentages of thread height.

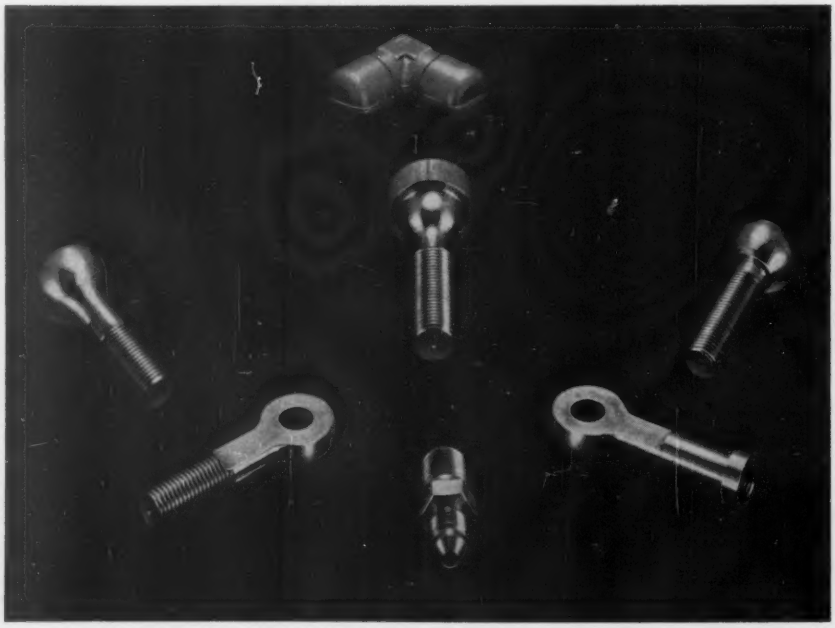
* * *

Titanium Aircraft Fasteners and Fittings Reduce Weight

Substitution of corrosion-resistant, high-strength titanium for steel in the manufacture of aircraft fasteners and fittings was the subject of a recent symposium held by the Western Division of the National Aircraft Standards Committee in Los Angeles, Calif. Aircraft manufacturers, titanium fabricating concerns, and titanium suppliers were represented.

The fact that aircraft designers will call for more and more titanium and titanium alloys was indicated by statistics compiled for one airplane. It was found at Northrop Aircraft, Inc., that one particular model contained 1243 pounds of fasteners and fittings. The use of titanium for these specific items would result in a weight reduction of 500 pounds.

Concerns directly interested in fabrication indicated that difficulties were encountered in trying to cold-head titanium using the same process employed for steel. Much development work will be necessary to change to hot-heading techniques, and automatic, high-speed, hot-heading machinery will be needed. It was felt that this process might become a reality within two years.



Aircraft fittings produced from titanium alloys are undergoing extensive tests.

Brazing Steel Coils to Aluminum Plates at Servel

Through the combined efforts of several companies, a practical process for brazing two dissimilar metals—steel and aluminum—has been established. This type of operation, formerly considered impractical on a production basis, is now being satisfactorily performed

By Herbert Chase

EVAPORATORS of the gas refrigerators produced by Servel, Inc., Evansville, Ind., contain either one or two serpentine coils of seamless steel tubing. The coils, which have a 7/8-inch outside diameter and 0.065-inch thick walls, must be brazed to 1/8-inch thick aluminum plates. To join these two dissimilar metals in this manner proved extremely difficult. It was, in fact, considered an impractical task to accomplish on a commercial scale.

Nevertheless, Servel engineers directed research toward uncovering a means of doing this brazing satisfactorily on a production basis. They received close cooperation from several companies—in the form of technical assistance from the Aluminum Company of America, the development of a satisfactory furnace atmosphere by the Lindberg Engineering Co., and the development of a suitable continuous brazing furnace by the General Electric Co. A sizable monetary outlay was required for the facilities, including the continuous furnace and its accessories, but the investment has been fully warranted by the consistently satisfactory results obtained. Not only are the steel coils brazed to aluminum sheets but the coils are also clad with aluminum alloy during the process.

The first step in fabricating an evaporator panel is to form a precut length of steel tubing into a grid-like coil having, in some cases, as many as nine hairpin bends. Each end of the tube extends beyond the coil proper and is later induction brazed to a mating tube of the refrigeration system. After forming, the coils are an-

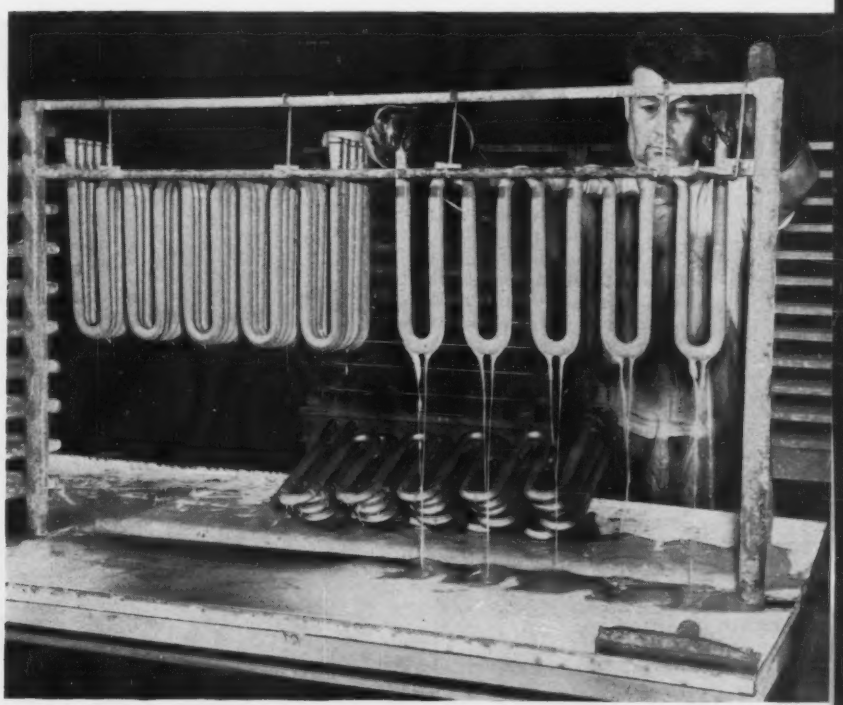


Fig. 1. After the seamless steel tubing has been formed into coils, flattened, and grit-blasted, the coils are lowered into a tank containing aluminum brazing flux and then hung to drain.

Fig. 2. Aluminum brazing sheets are also coated with flux, after which they are located in fixtures together with the steel coils. Flux-coated aluminum clips are pressed over the coils so that they too will be bonded into the assembly.

nealed and subsequently flattened. This flattening operation is necessary to insure that one entire side of the coil, with the exception of the tube ends, will lie perfectly flat on the aluminum plate or brazing sheet.

Prior to the brazing, each coil is grit-blasted externally to obtain a clean but slightly roughened surface. This is desirable for the production of strong, uniform, brazed joints as the rough surface tends to draw in the molten filler metal. The clad backing plates are purchased already cut to size from aluminum brazing sheets.

Highly important to the success of the welding operation is a suitable flux. In this case, Alcoa No. 33 brazing flux, which is generally employed for jobs involving aluminum, was used. This particular flux is a liquid that is furnished in sealed containers. It is applied by hand-dipping each coil into a tub filled with the liquid. Only the two extending ends remain uncoated. The flux is applied in this way to make sure that all exterior surfaces receive a coating because, during heating, the coils are clad with aluminum.

After dipping, each coil is hung on a rack

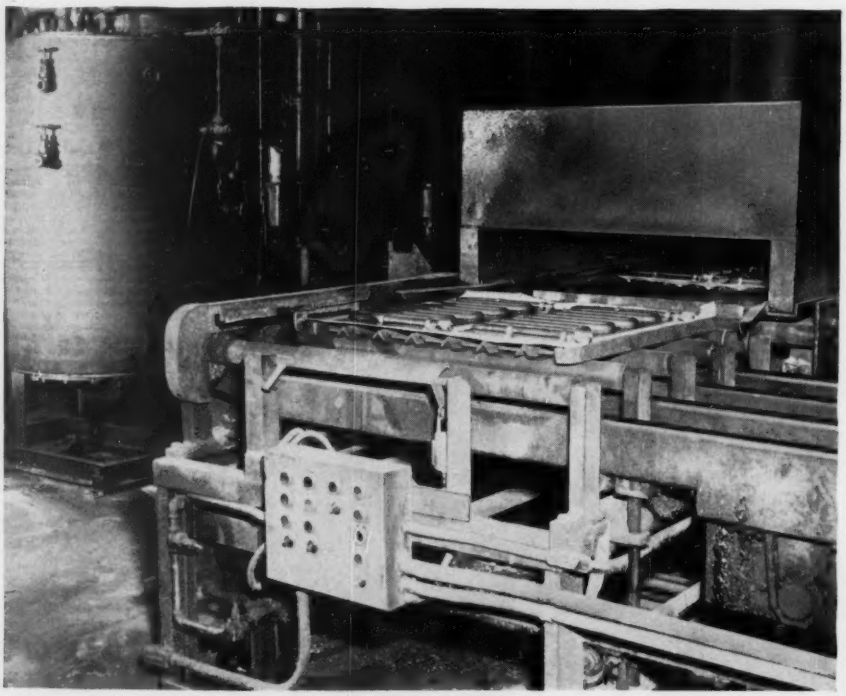


Fig. 3. Trays holding the assemblies to be brazed are transferred to the roller hearth of the furnace from a conveyor at the right. The generator that supplies the furnace atmosphere may be seen at the left.

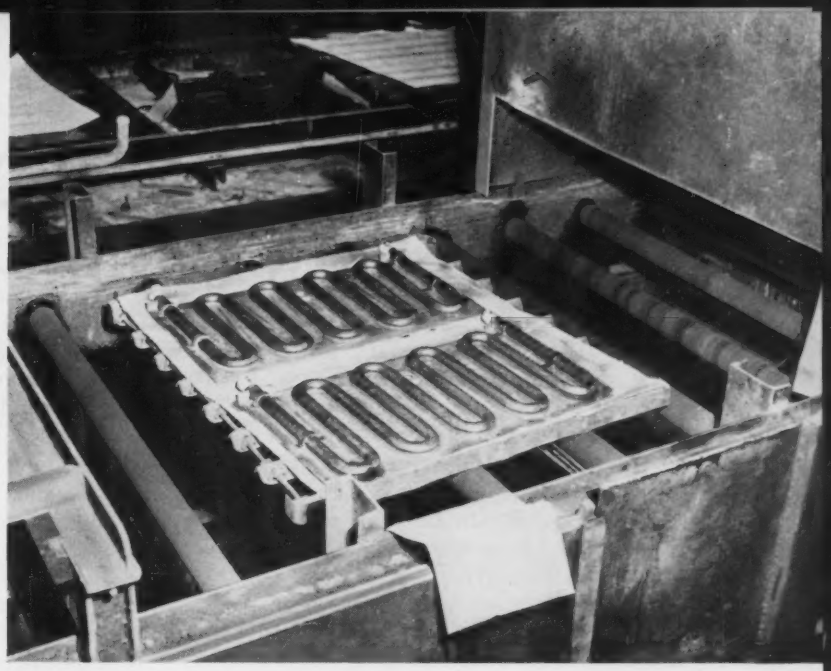


Fig. 4. Coils are securely bonded to their backing plates and clad with aluminum when they leave the furnace on a tray covered with an asbestos sheet. The brazed assemblies are removed from the trays and passed through a cleaning bath.

above the tank, Fig. 1, for approximately twenty seconds so that the excess flux may drain off. As the dipping and draining operation continues on the coils, a second man applies the same flux to the clad face of the brazing sheet by means of a brush, the plate being laid horizontally on a bench adjacent to the flux tank. Individual plates are then placed in a simple bench fixture, as shown in Fig. 2, and a coil, or two coils in some cases, is located in position. Aluminum U-shaped clips are also flux-dipped and placed over the coils at regular intervals. They are driven down with a hammer until their feet contact the brazing sheet.

When all the clips are in place, two lengths of aluminum wire having a low melting point are placed between the legs of each loop, following which the tube ends are blocked off. The assembly is placed on an asbestos sheet resting on a metal tray and is advanced along a roller conveyor to the loading end of the brazing furnace, Fig. 3. Although the trays are used many times, the asbestos sheets are discarded after two or three trips through the furnace. A continuous General Electric furnace using resistance heating elements is employed.

An automatic transfer device moves the loaded trays, one at a time, onto the roller hearth of the furnace along which they advance automatically. A complete transit of the furnace, including a preheat to remove the alcohol from the flux, requires seventeen minutes. The plates are not touched by hand until they are removed from the conveyor at the completion of the brazing cycle.

During this cycle, the assemblies pass through three zones in which there is a controlled atmosphere. The temperature is maintained at the desired level by means of Leeds & Northrup and General Electric controls. In the first two zones, the temperature is kept at 1200 degrees F., but the speed of the roller hearth is such that the work does not attain this heat. The temperature in the third zone is 1185 degrees F. Passage through the furnace results in the forming of a strong joint; moreover, the tubing becomes clad with aluminum.

As the trays emerge from the exit side of the hearth, Fig. 4, fast-moving rolls transfer them to another roller type conveyor where partial air-cooling takes place. The assemblies are removed by hand and placed on an overhead conveyor that carries them through a bath containing a water solution of phosphoric acid. The parts are still hot when they enter the bath. This cleaning operation removes any remaining flux and also leaves the brazed units clean and ready for assembly. Only one step remains, however, before the parts can be assembled. A press operation is necessary to remove any bow in the plates that may have been caused by the difference in the coefficients of expansion of aluminum and steel, or by the temperature change between brazing and subsequent cooling.

The trays do not pass through the bath but continue along the conveyors to the loading station where they are reloaded for the next cycle. An important factor in this particular brazing process is the atmosphere of exothermic gas that is produced in a generator burning natural gas. Products of this combustion are scrubbed free of carbon monoxide and carbon dioxide, while the water vapor is removed by refrigeration and by using an activated alumina dryer. The remaining gas is largely nitrogen having a dew point of minus 40 degrees F.

Swivel-Table "Copymill" for Automatic Contour-Machining

HIGH-SPEED automatic contour-milling of aluminum aircraft forgings, castings, or extrusions is possible with the "Copymill" machine seen in Fig. 1. This traveling, bridge type milling machine, built by the Mercury Engineering Corporation, Milwaukee, Wis., was designed especially for the aircraft industry. Machine tools presently being constructed and used by the industry were studied, comments from all aircraft manufacturers were solicited, and close contact was maintained with United States Air Force officials.

Unusual features of the Copymill include a swivel-table, a three-dimensional tracer control system, direct-reading dial indicators, and a hydraulic drive. Sufficient rigidity is provided to make high traverse rates possible without deflection. Infinitely variable spindle speed and feed ranges are optimum for milling aluminum.

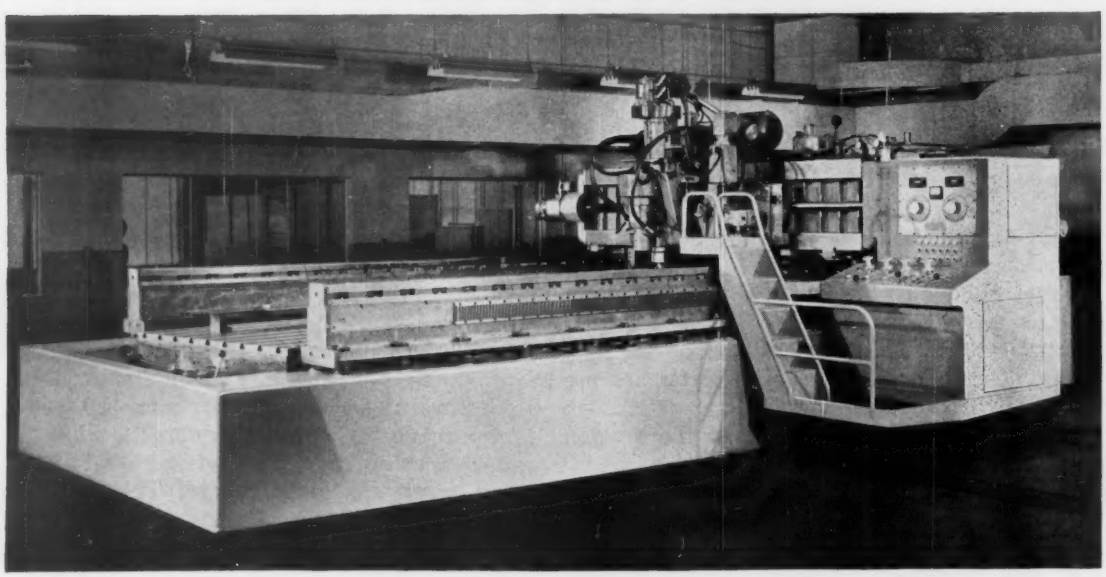
The table and work on the Copymill remain stationary while the bridge structure, carrying the cutter-head and three-dimensional contour controls, travels along the entire length of the table. This permits mounting all control elements and moving parts on one structure, and the work bed length is unlimited.

The bridge structure travels along two longitudinal guideways on four large rollers turning on anti-friction bearings. Rapid acceleration and deceleration are greatly simplified by this system. Longitudinal motion is imparted to the bridge structure through two racks, one on each of the guideways, as seen in Fig. 2. These racks are engaged by two spur pinions, each driven through a unique torque tube construction by a single fluid motor, with torque applied to the axial center of the tube. This design provides good torsional rigidity, minimizes backlash, and eliminates the possibility of lateral misalignment of the bridge, which is guided on one side.

The cutter-head is carried on a saddle which slides on ways mounted in a vertical plane on the face of the bridge. The saddle carrying the cutter-head is moved along the ways by a rotating screw in a fixed nut. This lateral feed-screw is operated through a fluid motor identical in size and type with that on the longitudinal feed.

The mounting of the cutter-head on the saddle is universally free to pivot so that the spindle can be swung to any angle in any plane. Depth control is obtained through a lead-screw construction integral with the head and which is exactly concentric with the spindle axis. This eliminates side thrust on the spindle structure and results in positive and chatter-free control. The depth lead-screw is controlled by another fluid motor.

Fig. 1. Over-all view of Copymill machine developed for the high-speed automatic contour-milling of aluminum forgings, castings, and extrusions.



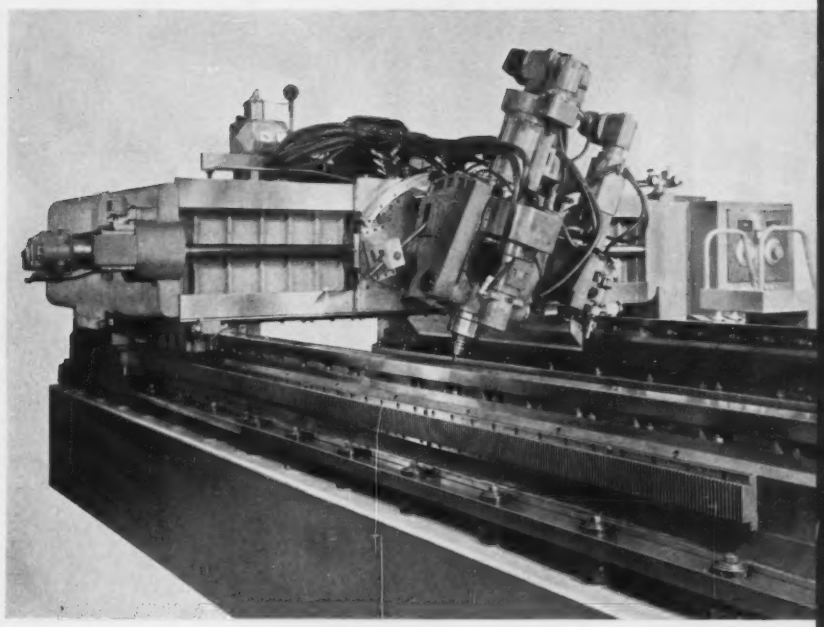


Fig. 2. Racks on the longitudinal guideways of the Copymill are engaged by hydraulically driven pinions to obtain longitudinal motion of bridge.

An ingenious device called a "Jumpout" is incorporated in the cutter-head. This device will instantaneously withdraw the cutter from the work in case a chip lodges under the cutter, and protect the surface from being scratched and the tool from fracturing. The spindle is driven by a fluid motor and the speed range is infinitely variable from 1000 to 10,000 R.P.M. A direct-reading tachometer on the control panel registers actual spindle speeds.

Leveling devices are provided every 20 inches along the guideways to maintain them level regardless of foundation settling. After the guideways are aligned and leveled, the machine itself is used to mill the seating pads for the work-table. These seating pads are actually aluminum blocks set into the concrete table foundation.

The work-table is provided with a centrally located pivot, allowing 7 1/2 degrees of angular motion each side of the longitudinal center, as illustrated in Fig. 3. This is an advantage when making long oblique cuts at rapid feed rates. For example, aircraft wing ribs can be milled without cams or a duplicator. Hardened and ground locators are provided so that gage-blocks may be used to obtain accurate angular positioning. The table is moved by means of a hydraulic cylinder.

Although this machine has a working area of

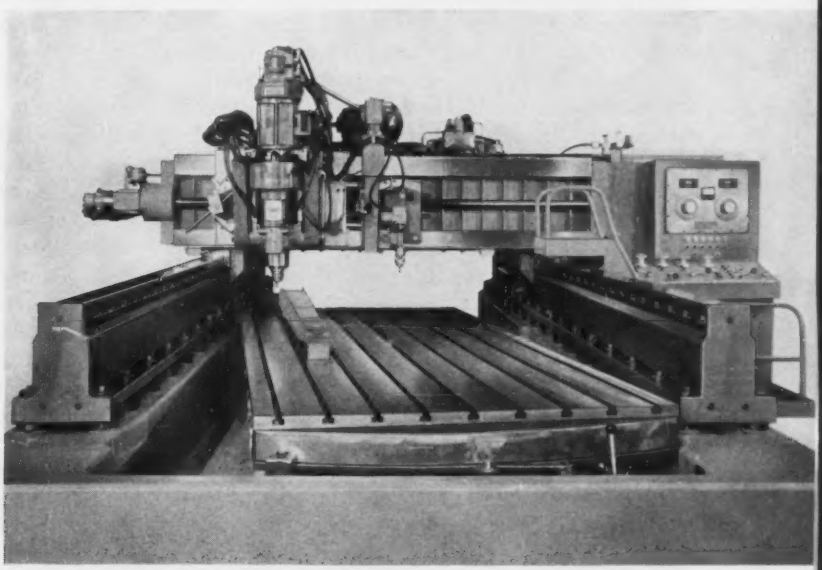


Fig. 3. End view of the contour-milling machine illustrates how work-table can be swung around the central pivot, an angular motion of 7 1/2 degrees to either side being possible.

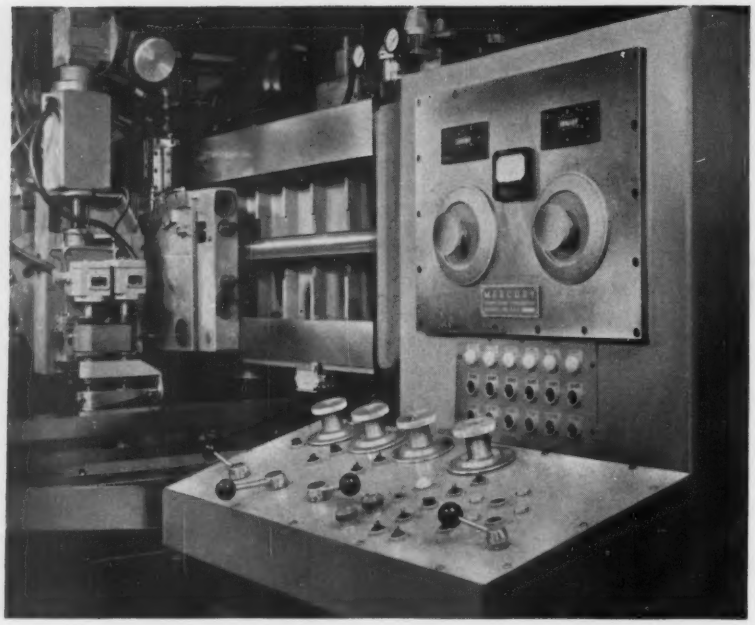


Fig. 4. Three-dimensional, combination electrical-hydraulic, contour-duplicating system is seen at left, and the control panel at the right.

72 by 180 inches, the design could be adapted to any width up to 120 inches, and unlimited length. Also, the working area could be increased by placing the duplicator on an arm extending to the side of the machine, with the template mounted on a separate table.

The Copymill has an electrical-hydraulic, three-dimension contour-duplicating system, in which a full-size master is reproduced through a tracing finger, as seen at the left in Fig 4. It has a compound stylus which registers depth and any horizontal component, depending upon the quadrant in which it is operating. The tracing finger follows the template and is sensitive to deflections in three directions. Also, digital controls, employing a magnetic tape or film, are readily adaptable. Double hydraulic motors are incorporated in both the longitudinal and transverse drives, allowing a speed range from 0 to 300 inches per minute.

Burned Spots in Fiber-Disc Grinding

In fiber-disc grinding, burned spots usually show up as bluish discolorations of the metal surface. This indicates that excessive heat has been generated, with the resultant drawing of the steel temper. Burned spots are generally caused by slow movement of the grinding disc across the work, applying too much pressure, and using a worn-out or glazed disc.

When polishing metal with a fiber grinding disc, the disc should be kept moving across the work constantly, according to *Grits and Grinds*. One-second timed strokes 2 to 3 feet long are best for flat work on 24-gage or heavier stock. A faster working rhythm is recommended for polishing curved surfaces on which contact area is smaller and working pressures greater. Stiff backing pads should be used for flat surfaces, and flexible pads for curved surfaces.

Excessive working pressure—usually a result of the operator attempting to compensate for other faults in his grinding technique—causes heating or burning of the work, slowing of grinder speed, and glazing or loading of the disc. Pressure applied to the grinder should be only enough to hold a 1-inch wide rim of the disc against the work with the tool spindle inclined at about 75 to 80 degrees from the surface.

Disc glazing occurs either when spaces between the abrasive grains have been filled with grinding swarf or the grain cutting edges have been dulled. Consequently, the abrasive grains cannot penetrate into the work but rub over the surface, generating heat but not removing material. Disc glazing may be avoided by choosing the proper disc and running it up to speed.

The choice of disc grit size and type depends on the material to be ground and the type of finish required. As a general rule, coarse sizes of coated abrasives (16 to 50 grit) are best for fast removal of metal. Fine-grit (60 and finer) discs produce good finishes on sheet metal for painting, plating, or bluing.

TOOL ENGINEERING *Ideas*

Tools and fixtures of unusual design and time- and labor-saving methods that have been found useful by men engaged in tool design and shop work

Toolpost Fixture for Radius Turning

By GEORGE W. WILSON, Mankato, Minn.

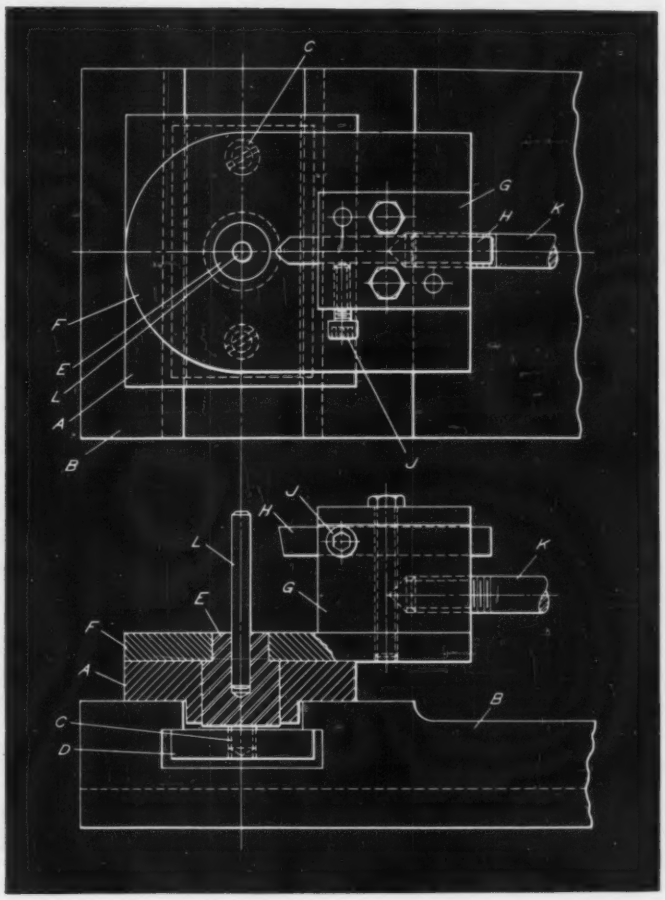
Turning rounded ends on work-pieces, such as punches for upsetting dies, can be simplified by using the toolpost fixture illustrated. With this fixture, the desired radius is pre-set: all that remains for the operator to do is swivel the cutting tool by means of a convenient handle screwed into the tool-block.

A T-shaped base *A* fits in the toolpost slot of compound rest *B*. Two fillister-head machine screws *C* pass through the base and engage anchor plate *D*, thus providing a means of locking the fixture in place. A hole is drilled through the base to receive a stepped plug *E*. The larger diameter of the stepped plug is machined to provide a running fit.

The upper, or smaller, diameter of the plug is pressed into a hole drilled through rotating plate *F* so that both the plate and plug move as one unit. A tool-block *G* is bolted on the top surface of the rotating plate, as illustrated. It consists of a rectangular steel block with a groove milled across its upper surface to accommodate tool bit *H*. A plate is pinned on top of the grooved surface to form a permanent cover. Lock-screw *J* serves to hold the tool bit in place. For easy operation, a handle *K* is provided. It is threaded on one end and screwed into tool-block *G*.

To facilitate setting the cutting tool to the desired radius, pin *L* is employed. It fits in a hole located on the upper surface of plug *E*. The proper radius is measured between the center of the pin and the cutting edge of the tool bit. After the setting of this radius has been completed, and the cutting tool secured in place by means of lock-screw *J*, pin *L* is removed. The toolpost fixture is now ready for operation.

This fixture may be used with the compound rest set either perpendicular to the lathe bed or parallel to it. If perpendicular, the lathe carriage can be used to feed the cutter into the work; if parallel, feeding can be done with the compound rest. In either case, the radius is formed by manual rotation of plate *F* with the aid of handle *K*. By mounting the tool-block close to the center of the fixture so that the tool bit extends past the center, concave forms may be cut. With the tool block located in the position illustrated, convex forms may be cut.



Fixture designed to facilitate turning of radii is mounted in the toolpost slot of a Conventional lathe.

Milling Two Different Radii on One Curved Surface

By W. M. HALLIDAY, Southport, England

Milling the arc-shaped outer edge of the brass casting shown at X in Fig. 1 presented numerous difficulties in regard to holding and feeding the work. The edge to be machined consists of two blended curved portions of different radii, the longer section being a 9-inch radius, and the shorter, a 4-inch radius. Along the center of this curved rim is a shallow rectangular groove of a similar contour.

Member *A* of the fixture shown at Y is a right-angle cast-iron base bracket which is machined all over. The horizontal leg of the bracket contains four drilled holes to receive standard hold-down bolts. Locating tongues to engage the table T-slots may be provided.

A groove is milled across integral cast boss *B* to receive the lower end of steel arm *C*. This arm

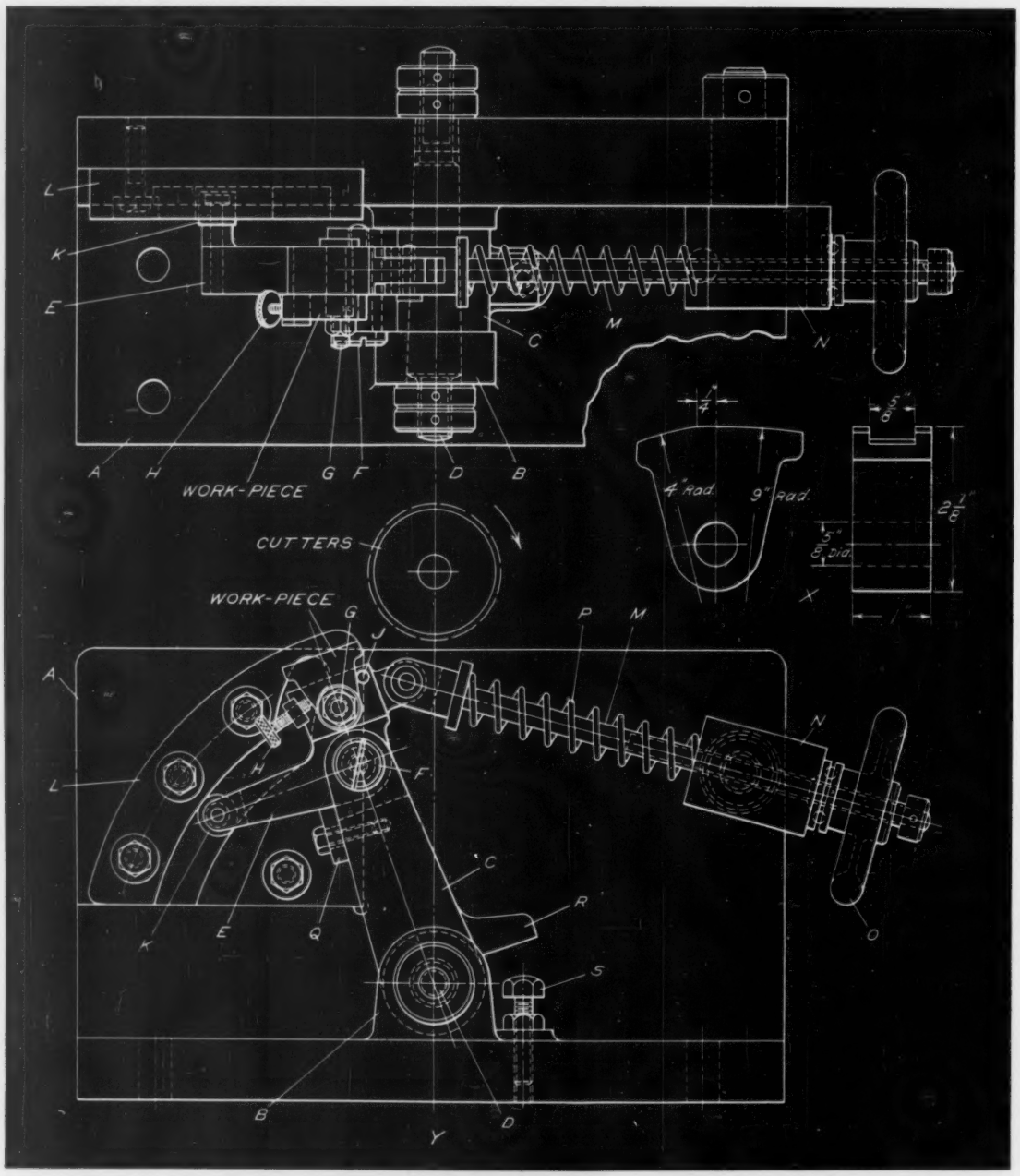


Fig. 1. Milling fixture designed for machining a curved surface composed of two different radii

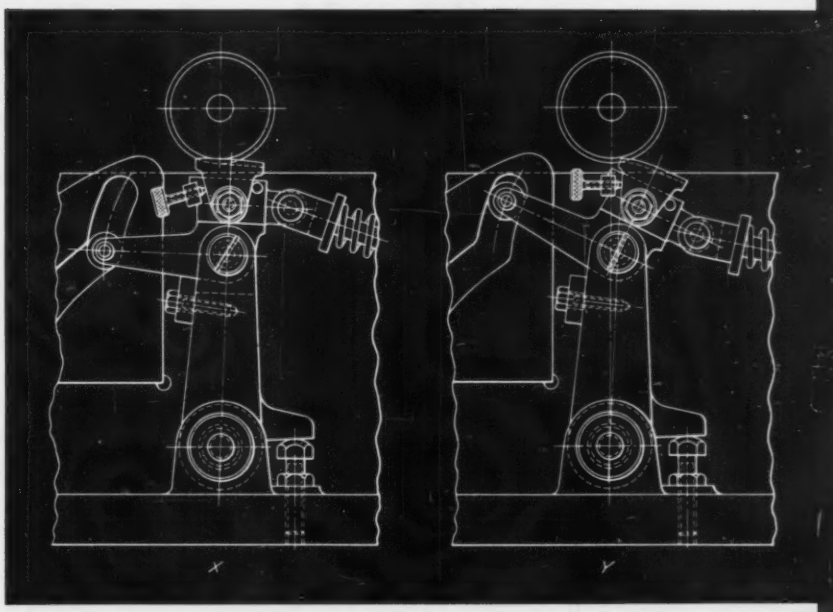


Fig. 2. Fixture is shown at X after milling 9-inch radius. Position of fixture components at completion of operation may be seen at Y.

pivots on a hardened and ground tapered shaft *D* which fits in tapered holes in both boss cheeks. Mounting the arm on a tapered shaft permits making adjustments to compensate for wear, thus eliminating any play that might develop.

The upper end of the arm is slotted to receive L-shaped lever *E*. The two members are held together by means of a shoulder stud *F*, the reduced threaded end of which screws into a hole in one side cheek of the arm slot. Lever *E* must have a minimum amplitude of movement of 90 degrees independent of the arm movement.

Correct radial positioning of the work-piece is obtained by slipping the previously bored 5/8-inch diameter hole over hardened stud *G*. This stud is mounted on the upper arm of lever *E*. A hexagon nut threaded on the end of the stud serves to lock it against the lever. Radial locking is accomplished by turning knurled-head screw *H* to force the part against stop-pin *J*.

Steel roller *K* rides within a dual-curved track formed in the front face of steel plate *L*. The plate is secured in a recess in the upright base member. The radii of the two curved portions of the roller track correspond to the radii of the curvatures to be milled, but their relative lengths are not critical.

A lug on the right-hand side of lever *E* is pinned to the shackle end of rod *M*. At its opposite end, the rod passes through a clearance hole in a rectangular trunnion block *N*. This member has an integral shaft which fits in a bearing hole bored through the upright wall of the base bracket. A cross-pinned collar retains it in place, permitting a swiveling movement only.

Handwheel *O* is threaded on rod *M*. A standard ball thrust bearing is inserted between the handwheel and the trunnion block. To prevent the handwheel from being completely backed off, a mild-steel collar is pinned to the end of the rod. Coil spring *P* is situated over the rod so that it tends to move both the rod and the arm toward the left.

Two screws hold rectangular stop-plate *Q* against the left-hand side of arm *C*. The lower arm of lever *E* contacts the stop-plate when the centers of shaft *D* and studs *F* and *G* are in line.

A lug *R*, integral with arm *C*, is a stop for limiting the amount of clockwise movement imparted to the arm. At a certain point in the cycle of movements, the under side of this lug strikes the head of an adjustable stop-screw *S*. Its proper adjustment must be determined by trial and error.

After the work-piece is securely mounted in the fixture, the handwheel is slowly rotated so as to draw rod *M* and connected members to the right. Under this movement, arm *C* will swivel in a clockwise direction, lever *E* moving in unison with it because of constraint applied by the engagement of roller *K* within the lower portion of the curved track. Accordingly, the work-piece is fed beneath a gang of three cutters, the center one being used to form the shallow groove.

The positions assumed by the various working members of the fixture when the 9-inch radius has been completed may be seen at X in Fig. 2. The radius of the milled portion of the work-piece will be equal to the distance from its rim to the center of shaft *D*.

As rotation of the handwheel continues, arm *C* remains stationary due to the contact of lug *R* and set-screw *S*. At this point, lever *E* swivels about stud *F*. This swiveling action occurs as the roller rides in the shorter portion of the curved track.

The position of the fixture at the completion of the milling operation is shown at Y, Fig. 2. This second phase of the milling cycle produces a curvature on the rim of the work-piece of a radius equal to the distance from the rim to the center of stud *F*. Thus, with a single continuous movement of the handwheel, both radii are quickly machined.

The Men in the Money

WINNERS in the Ingenious Mechanisms Contest that was recently conducted by MACHINERY have been announced by the judges. They are as follows:

$200 Prize

"Direction-Changing Drive"
By Fritz Twelsiek, Dusseldorf, West Germany

$100 Prize

"Dual Gear Train Diminishes Backlash"
By B. J. Popper, Kfar-Ata, Israel

$50 Prizes

"Cut-Off Actuating Mechanism"
By Walter Hommel, Phoenix, Ariz.

"Foolproof Indexing Mechanism"
By T. R. Goulden, Lanarkshire, Scotland

$25 Prizes

"Embroidery Floss Skein Winding Machine"
By R. T. Stewart, Winston-Salem, N. C.

"Excessive Torque Reverse"
By H. B. Schell, Brooklyn, N. Y.

"Blocking Device for a Geneva Wheel"
By W. Pont, Eindhoven, Netherlands

"Drive for Two Slides Having Variable Strokes"
By W. M. Halliday, Southport, England

An unprecedented number of noteworthy articles were entered in the contest. Honorable mention was made of entries submitted by the following contributors:

Charles and David Golosman, Brooklyn, N. Y.
S. P. Gould, Porterville, Calif.
Paul Grodzinski, London, England
George Herzl, Camden, N. J.
A. W. Jansson, Orrville, Ohio
Otto Lichtwitz, London, England
Oscar Negalis, Santiago, Chile
R. B. Ogden, Shortsville, N. Y.
Samuel Rosen, Lorain, Ohio
Federico Strasser, Santiago, Chile
F. R. Terell, Leicestershire, England
J. A. Vernon, Philadelphia, Pa.
D. D. Wells, Hamilton, Ohio

The prize-winning articles and those receiving honorable mention will be published in the Ingenious Mechanisms Department during the coming months. This Department—a regular feature of MACHINERY since 1927—is invaluable to machine designers. It contains articles describing mechanical principles that can be applied in designing automatic machines and other devices that differ widely in purpose.

Tungsten Carbide Impacted Hydrostatically

Tungsten-carbide tips and tools heretofore produced by the Valenite Metals Corporation, Royal Oak, Mich., for a limited group of user plants for production test purposes, have now been placed on the general market. A complete line of standard tools and blanks is available.

Productive processes are based on vacuum sintering techniques, and all material is hydrostatically impacted. No mechanical pressure is used to compact the powder into the pre-sintered mass. Instead, the powder is molded in evacuated latex bags. Then the pre-shaped carbide powder charges are immersed in water and subjected to a series of high-pressure impacts. Pressures used, according to Valenite engineers, exceed those that would result within a 16-inch naval gun fired with the muzzle closed. The equalization of the pressures in all directions is said to result in uniform density and uniform shrinkage throughout the parts. Sintering of all blanks is performed electronically.

Causes of Babbitt Bearing Failures

Failure of babbitt bearings, in the first place, is often due to selection of the wrong bearing metal for the job at hand. In the making of bearings, improper bond between the liner and the shell, porosity of the liner, segregation of the constituents in the liner, and hard spots which cause scoring of the shaft are all factors that contribute to failure. When the bearings are installed, the presence of foreign particles, such as dirt or metal chips, will cause scoring or seizing of the shaft, insufficient or excessive clearance, and misalignment of the shaft.

In the operation and maintenance of bearings, contributing factors to unsatisfactory performance are as follows: the use of improper lubricants, failure to filter foreign particles from lubricants, overloading and overspeeding of the equipment, corrosion due to overheating of lubricant, corrosion due to dilution of lubricant with acidic compounds or water, and fatigue caused by compressive and bonding stresses.

Talking with Sales Managers

By BERNARD LESTER
Management Consulting Engineer

Alertness to Change

THE capable plant manager fights to overcome obsolescence. He is keenly aware of the importance of proper plant lay-out, tools, materials, and methods. He can visualize clearly the results of possible changes that will increase efficiency. Not so with the sales manager.

The sales manager's efforts to avoid obsolescence are in many respects more complex. More variables and unknown factors confront him. Changes are not as tangible as those in shop practice. There is a tendency to delay action until it becomes discomfortingly real. Instead of aggressively preventing fire, the sales manager's energies are often exhausted in putting out the flames.

In reviewing industrial sales organizations, it is not difficult to spot examples of weakness that are directly attributable to failure to recognize changes, and lack of preparation to meet them. Let us cite a few glaring examples. They may not be new to many of us, but they so often occur without a full realization of their consequences.

1. One company reached the embarrassing stage in which it was found that only a few products were being sold to a dwindling market. This matter had been discussed at various times but never appeared first on the planning agenda. Time, prestige, and business were lost and the company started to flounder.

2. A second company suddenly realized that in a large geographical area there had been a steady increase in the demand for its products, but that no provision had been made to meet this expanding market, and so sales had started to fall off. To fill the gap, it was necessary to "rob" other territories of manpower. It took a long time, however, to regain its position in the area.

3. A third company, in analyzing the average age of its sales force, discovered it was lacking in younger men. Somewhat tardily it began to recruit young men. Meanwhile, time had removed valuable older men from active service.

4. A fourth company found its market evaporating because no advances had been made in the design of its products. Competitors had developed outstanding equipment to perform operations in a new way. The company in question had to start from scratch in redesigning old equipment and perfecting new.

5. A fifth company, a machinery builder, developed a consumption item for sale to its customers. Salesmen of heavy equipment were depended on to sell this small-lot item. Belatedly it was found out that these salesmen were not fitted to solicit and handle a multiplicity of small orders. After much loss of time and business, the concern woke up and organized a division of specialty salesmen to sell directly in large industrial areas.

6. As a concluding case, a machinery supplier found out all too late that its selling literature was not informative. Though appealing in appearance, it was improperly geared to the needs of purchasing engineers who required detailed information. The management had relied on the assumption that any type of promotional literature was all that was needed.

These examples show how seriously inefficient a company may become in its sales operations. They point to the urgent need of being alert to change, and of taking the initiative in analyzing trends and changed conditions—and then getting into action.

Changing markets and products should be constantly evaluated. Methods and manpower should be repeatedly examined not only to obtain present-day efficiency but also to prepare for future changing requirements. Obsolescence occurs in every sales organization, just as it does in any shop.

LATEST DEVELOPMENTS IN *Shop*

Gleason Automatic Grinder Designed to Produce Straight Bevel Coniflex Gears

An automatic wet type grinder for the high-speed production of straight bevel Coniflex gears has been announced by the Gleason Works, Rochester, N. Y. This machine, the No. 105 straight bevel Coniflex grinder, produces gears up to 8 1/2 inches in pitch diameter, 1 3/8 inches in face width, and 3 diametral pitch of any standard pressure angle. Fine-pitch gears are ground directly from the solid blank. Gears with teeth coarser than approximately 20 diametral pitch are ground after cutting and hardening. Since the gear teeth are finished after hardening, the problem of heat-treating distortion is eliminated. It is thus possible to produce hardened straight bevel gears with a high degree of accuracy.

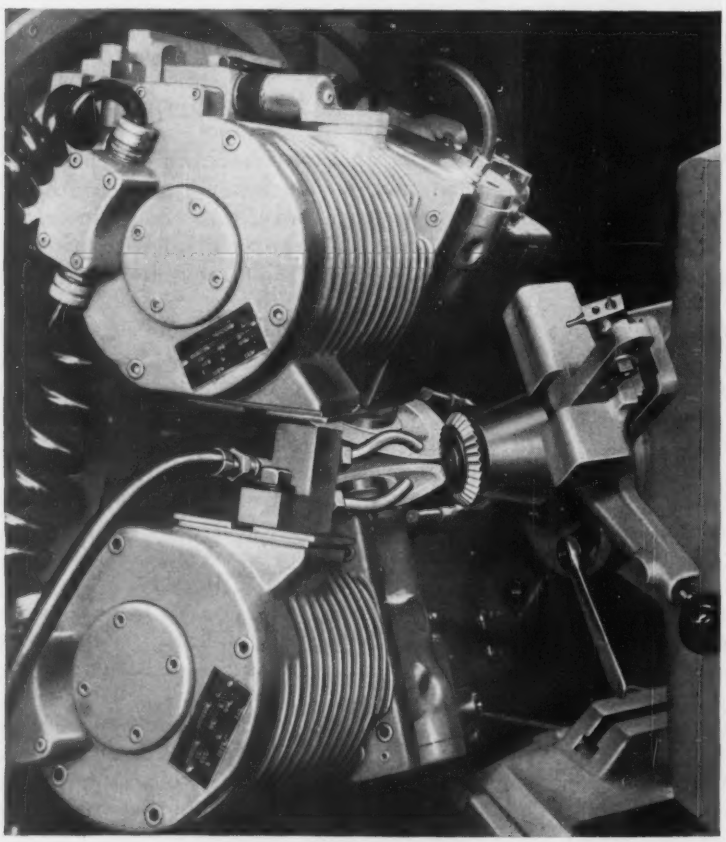


Fig. 1. Close-up view of the work-head of Gleason Coniflex grinder, showing the two disc type grinding wheels

Two disc type grinding wheels are used as shown in the close-up view, Fig. 1. The grinding is done on the flat sides of the wheels, and the tooth profile shape is generated by a relative rolling motion between the gear blank and the grinding wheels. There is continuous contact between the work and the wheels during the generating rolling motion.

Once the gear is chucked in the work-head, the entire grinding cycle is carried out automatically. The machine makes the correct number of passes, engaging the in-feed for the work, and dressing the wheels at pre-selected intervals, as required to maintain the desired finish and accuracy.

A control unit increases the speed of the wheels as the diameter is decreased by the dressing operations, thus maintaining a constant surface speed throughout the life of the grinding wheels.

Hood guards cover the grinding area, and a suction exhaust system draws the grinding mist back to the coolant tank. A single lever controls the hydraulic guard door and the chucking of the work, thus reducing the time required for changing work-pieces, as well as safeguarding the machine and the operator.

This grinder is built to produce gears of high accuracy, and the automatic features are said to insure uniformity of all pieces, regardless of quantity. The wet type grind is used for fast cycles and to obtain an excellent finish. Set-up calculations are simple, and the

Equipment

Machine tools, unit mechanisms, machine parts, and material-handling appliances recently placed on market

Edited by FREEMAN C. DUSTON

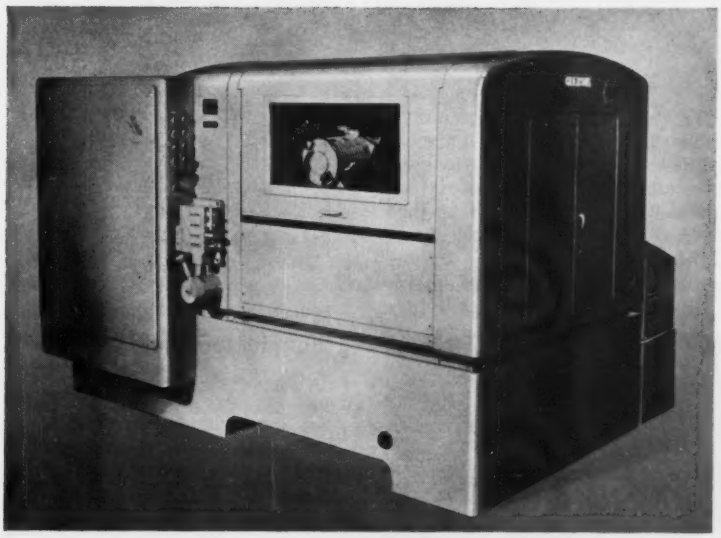


Fig. 2. Gleason straight bevel automatic Coniflex grinder

automatic cycle drum and a variable-stop set-in unit provide fast means for setting up the grinding cycle.

Circle Item 101 on postcard, page 241

Wade Precision-Built Hand Screw Machine

Continuous reversal of the direction of spindle rotation without reversing or overheating the motor is an outstanding feature of the No. 73 precision-built hand screw machine now being made by the Wade Tool Co., Waltham, Mass. The gear-box drive of this machine has a new clutch arrangement which provides for mechanical reversing. Helical gears in constant mesh, together with a clutch yoke and a variable-pitch drive pulley, comprise the basic features of the drive. They are designed to eliminate the heavy resistances usually required in the electrical drive, and also provide normal overload protection for the motor. Manual changing of belts to vary the speed is eliminated, and a positive drive timing belt replaces the previous V-belts.

The variable-pitch pulley on the motor shaft provides stepless speed control from 100 to 3500 R.P.M. through a worm and worm-gear operated by a handwheel. Spindle speed changing in a 5 to 1 high-low ratio is obtained by flipping a lever. A brake can be applied to stop the spindle shaft without halting the motor. The brake is applied by pulling a control lever which causes a brake shoe to be applied to a drum on the shaft.

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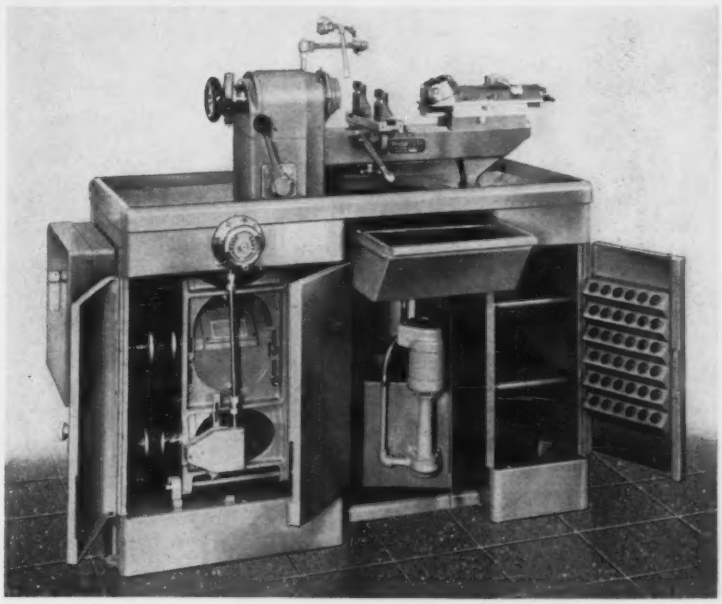


Hand screw machine with new variable-speed, reversing drive built by the Wade Tool Co.

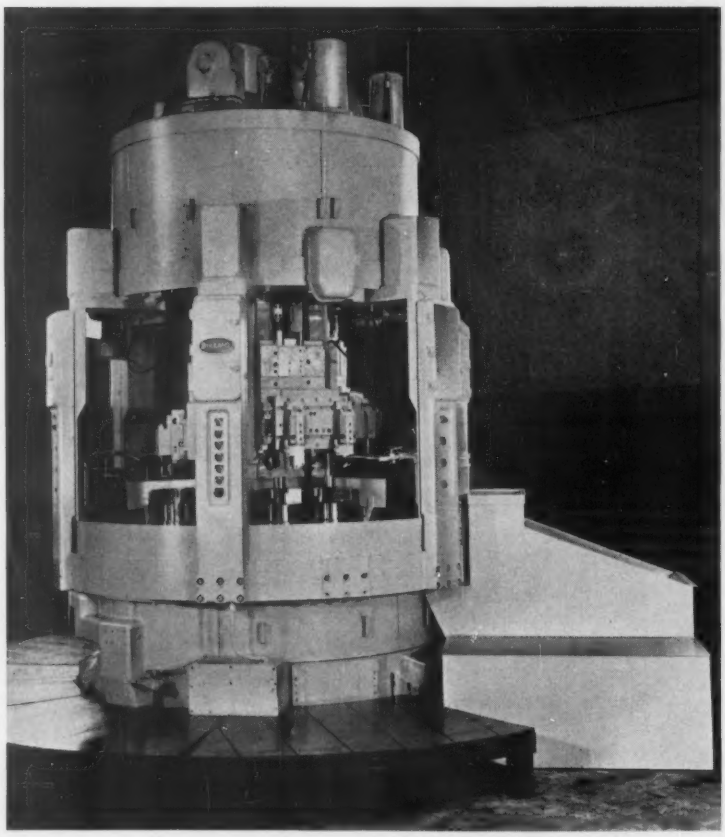
Bullard Mult-Au-Matic Chucking Machines

The Bullard Co., Bridgeport, Conn., has just introduced a Type "L" Mult-Au-Matic, the latest version of its multiple-spindle vertical type chucking machine which has been on the market since 1914. Many features new to this type of machine are said to make it even more efficient in the production of component parts in the automotive, aircraft, agricultural machinery, Diesel engine, electrical, and oil-field tool industries in which the earlier models are widely used.

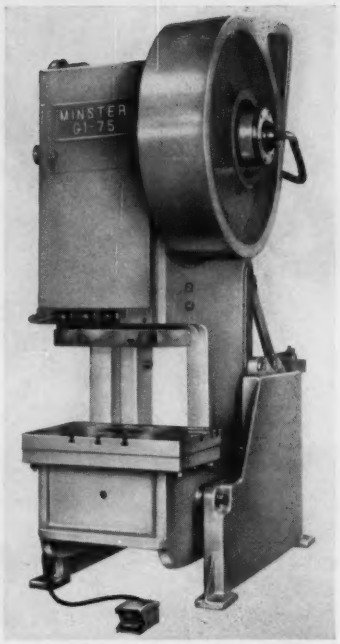
Outstanding features of this machine are the control system, which facilitates head-setting and tool adjustment, and a new screw type of feed mechanism. This feed mechanism, having a stroke of 16 inches, provides for more uniform advance of the cutting tools to the work than was previously possible with the cam drum type. Faster spindle carrier indexing serves to reduce the amount of time lost between cuts. Index registry and a new type of spindle bearing mounting are said to result in a higher degree of accuracy than previously attainable.

Selective feeds and speeds at each work station are possible through the use of a new type of gear synchronizer. For example, in the 10-inch machine, spindles may be geared to run up to 1000 R.P.M. as the spindles on the carrier are indexed from one station to another in the automatic cycle. The machines are of heavier construction and permit inputs of up to 150 H.P. Such accessories are available as multiple-purpose heads, drill heads, tapping heads, and precision boring heads. Automatic loading devices, automatic gaging equipment, and chip conveyors are additional items. All control units and gear units are made readily accessible to facilitate maintenance. Type "L" machines are obtainable in the 10-inch size built with six, eight, twelve, or sixteen spindles, and the 14- and 18-inch sizes which are built with six or eight spindles.

Circle Item 103 on postcard, page 241



Mult-Au-Matic vertical chucking machine recently placed on the market by the Bullard Co.



Gap press of new line introduced by the Minster Machine Co.

Minster Gap Presses with Fabricated Steel Frames

A line of fixed base and inclinable fabricated steel C-frame presses in the 75-ton class being introduced by the Minster Machine Co., Minster, Ohio, embodies the features of the 110-ton G1 series. The flywheel type, 75-ton gap press illustrated has a manual inclining arrangement and standard leg design. A special feature is the long flanged slide with barrel type adjustment. The slide face has a punch shank clearance hole and 3/4-inch T-slots running front to back. Front gibs are pre-set with ground spacers for proper clearance and alignment. Both cross-bar and cam type knock-outs are available. Pneumatic counterbalance cylinders are standard, and sliding die cushions can be had for fixed base presses.

The inclining arrangement provides for locking the press in the vertical position and in angular positions of 15 and 30 degrees. Manual, air power, or motorized inclining is also available. Electrical controls may be mounted in a centralized cabinet or in cabinet type panel legs that also include air controls.

These presses are easily adapted to automation production and can be equipped with dial, slide, or roll type automatic feeds, stock

straighteners, oilers, and scrap cutters. Special geared feeds are available. The standard slide stroke is 4 inches. Flywheel presses operate at 90 or 120 strokes per minute and geared presses at 40 strokes per minute.

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Spray Lubrication for Abrasive Belts

Two polishing oils, formulated for use in grinding and finishing metals, have been placed in the market by the D. A. Stuart Oil Co., Chicago, Ill., and the Minnesota Mining & Mfg. Co., St. Paul, Minn. "Excelene" FD is for finishing ferrous metals, and "Excelene" NF is for finishing non-ferous metals. These oils are applied to abrasive belts to reduce loading, provide longer belt life, and permit faster grinding and improved surface finishes. The oils are available in 12-ounce pressurized cans.

Circle Item 105 on postcard, page 241

H.E.B. Pilot Copying Lathes

Three Pilot automatic copying lathes, among the first built in this country for H.E.B. Machine Tools, Inc., by the Industrial Metal Products Corporation, Lansing, Mich., have been installed in a large automotive plant. These lathes are equipped for copy-turning automotive transmission parts at the rate of one part every fifty seconds, using two tools and maintaining a tolerance of 0.001 inch.

The rigidity of the machines and the patented hydraulic feed are said to result in tool life and finish previously unobtainable at such high cutting speeds under continuous production conditions. One man can handle a battery of at least three of these machines. It is only necessary for him to load a hopper.

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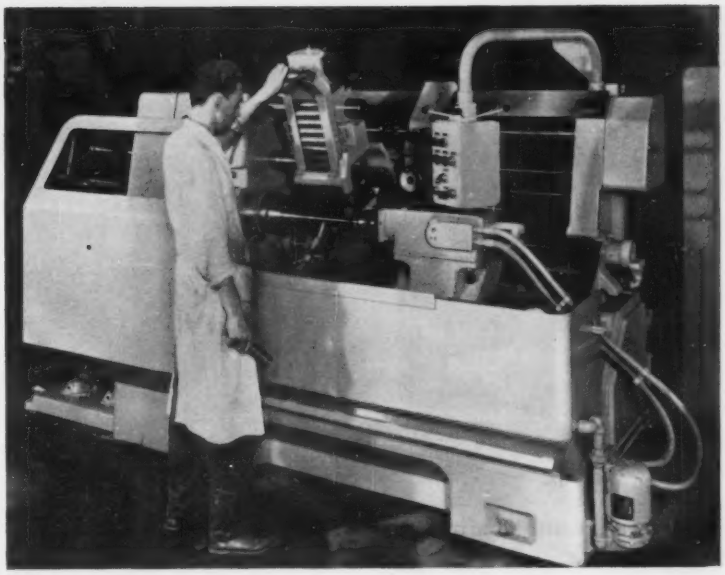
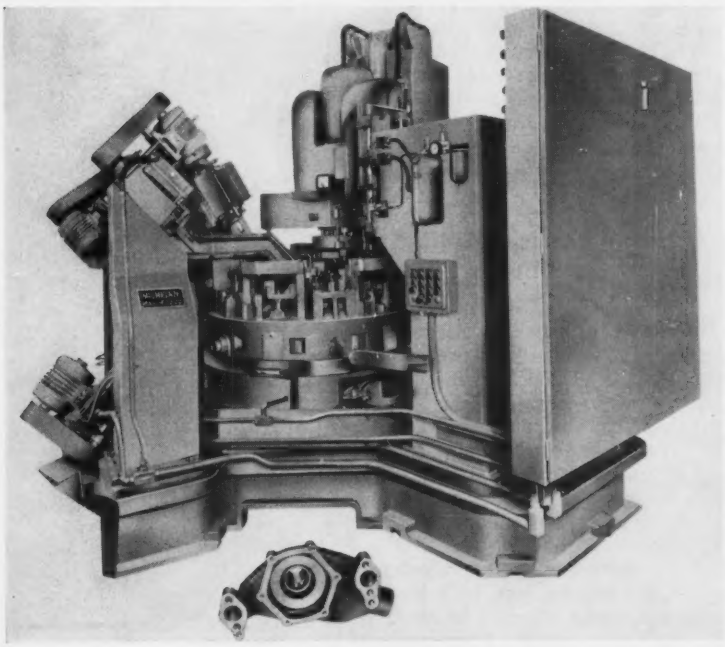


Pilot copying lathe now being built in this country by the Industrial Metal Products Corporation



Special "Angle-Matic" machine for processing water pump bodies built by Michigan Drill Head Co.

"Angle-Matic" Special Machine for V-8 Engine Water Pump Bodies

The Michigan Drill Head Co., Detroit, Mich., has built a special machine called the Michigan "Angle-Matic" which is designed for rapid, economical handling of an automotive part. This machine drills, chamfers, spot-faces, and taps water pump bodies for one of the new V-8 engines. It performs operations on both top and bottom of the pump body, and drills all the angular holes, by means of a two-position hydraulically operated fixture and angularly mounted units.

The machine is built around a standard Hydro-20 column assembly and incorporates a special base and risers for the horizontal and angular units. A Michigan 60-inch hydraulic index-table rotates the fixture, and all tapping is performed by standard units with individual lead-screws. The machine produces 120 water pump bodies per hour.

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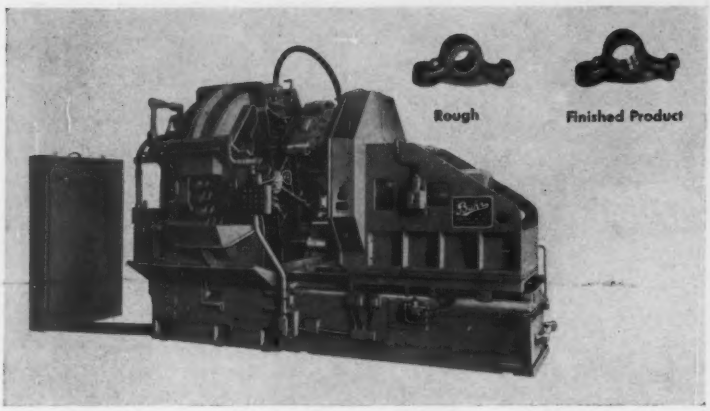


Trunnion type special machine for processing valve rocker arms, brought out by Buhr Machine Tool Co.

Buhr Trunnion and Dial Type Production Machines

Seven hundred and twenty valve rocker arms are processed per hour by a two-way six-station trunnion type special machine with hydraulic feed built by the Buhr Machine Tool Co., Ann Arbor, Mich. An unusual feature of this machine is the special hydraulically operated checking station which follows the drilling of 0.070-inch holes. This station automatically stops the machine if the hole is not drilled completely through.

The machine is equipped with a standard Buhr six-position cam-and-roller type automatic index-table complete with shot bolt. The six fixtures, which clamp and unclamp the work automatically by hydraulic power, hold four parts per station. Parts are automatically unloaded after the machining operations are completed. The twenty-spindle right-hand head has a master gear-box which incorporates five individual cluster heads. Other features include automatic lubrication throughout; hardened-and-ground laminated tool-steel ways; and multiple heads of ball-bearing construction with shaved gears.

A dial type hydraulic-feed multiple-spindle machine designed to perform a wide variety of operations at a high-production speed on steel-forged automobile front-wheel spindles is another recent Buhr development. This machine features a double-load fixture which holds two parts per station. It drills, reams, spot-faces, and burrs both sides of four holes, and combination drills and chamfers one hole in each part at the rate of 264 pieces per hour.

A seven-way hydraulic-feed dial type machine with an electronic mechanism for checking drill breakage is another new development announced by the company. This machine drills, chamfers, spot-faces and taps 377 master brake cylinders per hour. The taps are guided by individual lead-screws. Following each cycle, drill-checking arms swing sensing-probes to and from two 0.028-diameter drills. If either drill has been broken, a failure light flashes on and the machine stops. As long as the drills stand up, the special electronic sensing circuit permits each production cycle to continue.

The seven-position power-operated automatic index-table on this machine is 48 inches in diameter and is furnished complete with locking bolt.

Circle Item 108 on postcard, page 241

Clausing Vertical Milling Machine

The Clausing Division, Atlas Press Co., Kalamazoo, Mich., is building a heavy-duty, precision vertical milling machine intended for use in handling die, jig, and fixture work. The spindle head can be swiveled in a vertical plane and set at any angle, and the turret can be rotated in a horizontal plane, making it possible to mill at all angles with one set-up.

The quill has a micrometer depth control stop and both lever and handwheel feeds. All feed-screws have large micrometer dials. The table is 6 by 24 inches, and has a longitudinal feed of 15 inches and a transverse travel of 5 inches. The vertical knee has a travel of 12 inches and the quill, a travel of 3 inches. Six spindle speeds are available. The machine operates from a 1/2- or 3/4-H.P. motor.

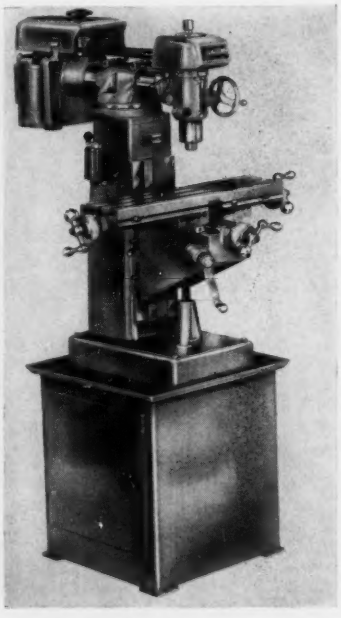
Circle Item 109 on postcard, page 241

Improved "Hi-Speed" Gear Units

The Philadelphia Gear Works, Inc., Philadelphia, Pa., has announced an improved line of "Hi-Speed" gear units for speed reduction and speed increase. These standardized units have been designed to operate at rotating speeds up to 9000 R.P.M. and pitch line velocities up to 10,000 feet per minute without modification.

The units are adapted for use in turbine drives, test stand drives, and air-conditioning applications. They are manufactured in seventeen sizes for ratings up to 7100 H.P. and are available in any specified ratio from 1 to 1 up to 10 to 1.

Gearing is of the double opposed helical type having hobbed and precision shaved teeth. Opposed helices eliminate thrust forces against bearings and housing. The gearing is dynamically balanced to provide vibration-free power transmission at even the highest rotating speeds. Housings include an ample oil reservoir and



Vertical milling machine placed on the market by the Clausing Division, Atlas Press Co.

"Hi-Speed" gear unit manufactured by Philadelphia Gear Works, Inc.

an integral pump and coolant system with spray nozzles directed at the line of gear contact. Bearings are of the centrifugally cast babbitted bronze type.

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H-P-M Presses Made in Wide Range of Sizes

Oil-hydraulic C-frame presses ranging in size from 2 up to 200 tons have been brought out by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio. This line, which includes eleven sizes, is designed for low tonnage jobs. A choice of control valve assemblies is offered for each press. The operating controls include single or dual safety operating levers, and electric push-button, foot switch, foot-pedal, and other standard types.

A high-speed differential circuit and control allow the press operator to "inch" the ram downward or upward while setting the dies. The open C-gap frame eliminates encumbrances within the tooling area and provides a maximum amount of room for tooling. The sixty-second ram-stroke adjustment is conveniently located outside the tooling area. The compact power units can be easily removed from the press frames. H-P-M relief valves are used to provide an infinite range of tonnage regulation on all models.

Production tooling accessories include standard bolsters, benches, bed extensions, straightening fixtures, hydraulic knock-outs, and die cushions. Many other standard and special mechanical accessories are available.

Circle Item 111 on postcard, page 241

Motch & Merryweather High-Speed Circular Sawing Machine

The Motch & Merryweather Machinery Co., Cleveland, Ohio, has brought out a Model No. 5 high-speed circular sawing machine with a capacity for cutting aluminum billets up to 43 inches in diameter. This machine has a steel gear case which encloses a heavy-duty, helical gear train mounted on pre-loaded roller bearings. The saw headways have non-metallic wear strips and forced-feed lubrication. Variable saw feed is by means of a hydraulic cylinder. The drive to the gear case is through multiple V-belts and pulleys by a 150-H.P. direct-current totally enclosed motor, operated by a motor-generator set which provides variable speeds within an 8 to 1 ratio.

Ample holding power for large stock is provided by the heavy upper clamp and gooseneck which clamps the stock against V-blocks in the lower vise. Elevating screws, connected across the top of the housing, actuate the upper clamp. Powered roller conveyors extend on both sides of the vise. Each section can be elevated independently to facilitate movement of the stock, and can be reversed if desired.

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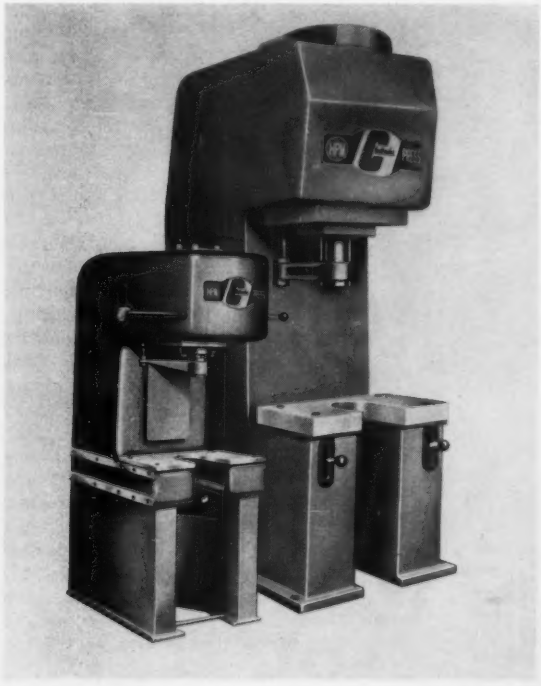
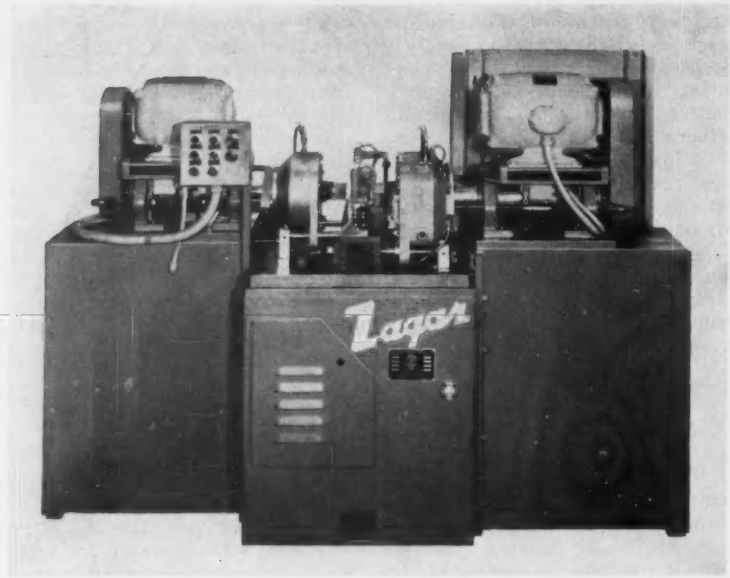


Bench and floor model presses of line designed for low tonnage jobs built by the Hydraulic Press Mfg. Co.

High-speed circular sawing machine built by Motch & Merryweather Machinery Co. to cut aluminum billets



Production drilling and countersinking machine built by Zagar Tool, Inc.

Zagar Production Drilling Machine

A special horizontal drilling machine, designed to produce steel inserts 3/8 inch square for an automatic transmission assembly but which can be used for the production of a wide variety of parts, has been built by Zagar Tool, Inc., Cleveland, Ohio. This machine is interlocked electrically for automatic operation. It has two hydraulic feeder units and two Zagar gearless drill heads.

The machine illustrated is equipped to drill twenty holes in one side of a rectangular rod of extruded bar stock at the first station. The work is indexed manually to the second station where the twenty holes are countersunk at both ends on opposite sides of the bar. The bar is indexed progressively until a 10-foot piece is completely drilled and countersunk. The piece is then put through an automatic punch press that cuts it into insert lengths. This machine has a potential production of 3600 holes per hour.

Circle Item 113 on postcard, page 241

Huge Hydraulic Pull-Down Broaching Machine

A 60-ton, 72-inch stroke hydraulic pull-down broaching machine, equipped to broach the internal spline and size the hole in over thirty different sleeve yoke parts, has been built by the American Broach & Machine Co., Ann Arbor, Mich. This is said to be the largest broaching machine (in tonnage) that has ever been built. Two 40-H.P. motors provide the power for the broaching stroke and for operating the fixture. The machine has four broaching stations with manual control levers.

Tooling includes a shuttle mechanism which automatically transfers parts into the broaching position and then retracts, allowing the operator to load during the broaching stroke. Split locating leaves, mounted on the shuttle unit, radially locate the ears of the yoke parts in relation to the splines to be broached. The parts are securely held in position until the broaching stroke has started, to insure accurate alignment. A rack and pinion with plunger allow the operator to rotate the locating leaves freely to facilitate loading.

The operator manually loads the machine and then pushes dual safety control buttons to start the cycle. The shuttle unit moves in to the broaching position. After the broaches move down and connect with the pull-heads, they are pulled through the parts. As soon as the broaching stroke has started, the shuttle unit returns, allowing the operator to reload. After broaching, the parts are ejected and the cycle is repeated.

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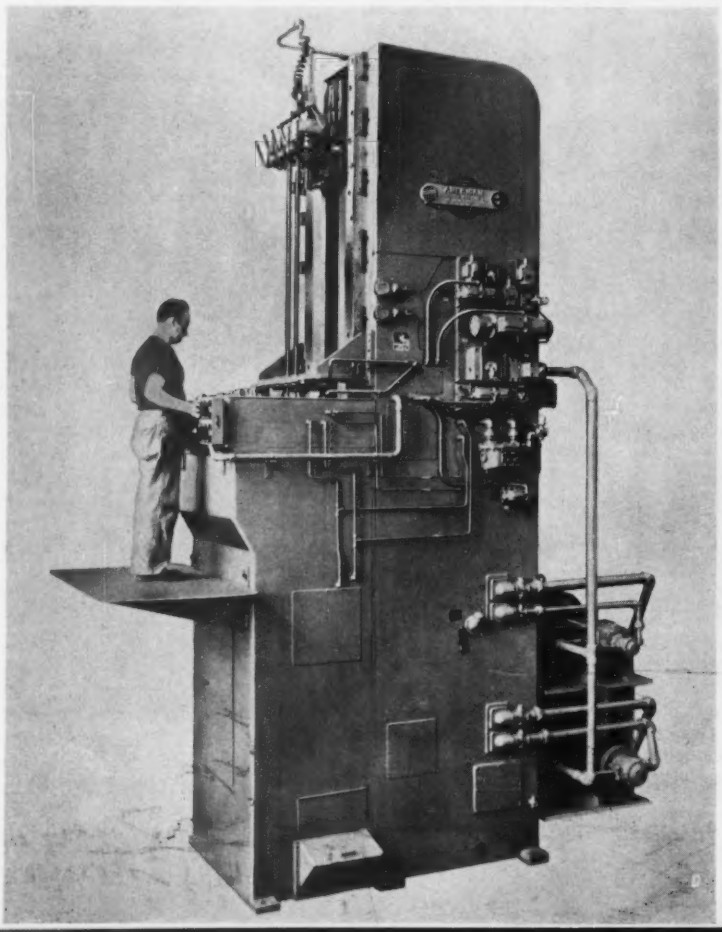


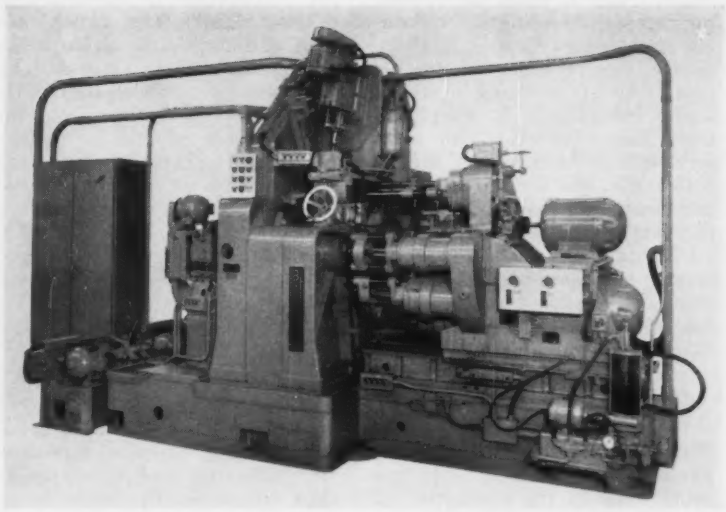
Hydraulic broaching machine built by the American Broach & Machine Co.

Barnesdril Drum Type Drilling, Tapping, and Chamfering Machine

A special nine-station drum type, high-production machine for drilling, tapping, and chamfering fuel pump bodies has just been completed by the Barnes Drill Co., Rockford, Ill. Bodies for different pump models can be interchanged on the drilling machine by substituting the proper auxiliary head to suit the different bolt circle specifications. Cluster style heads are designed to facilitate these change-overs. They operate high-speed steel cutting tools at maximum speeds, being capable of drilling at the rate of 12 inches per minute.

The machine is composed of right- and left-hand stations. It completes a full cycle in twenty-one seconds, drilling, tapping and chamfering fifty-seven different holes in fourteen different sizes, ranging from 0.062 inch to 1 3/8 inches in diameter, 20 to 32 threads per inch.

This machine is basically of Barnesdril unit type construction. It has one 30-H.P. unit with a thirty-eight-spindle head; two 1 1/2-H.P. units—one single spindle head and one two-spindle head; two additional drilling units; one single-spindle lead-screw tapping unit; and one fifteen-spindle unit.



Barnesdril drum type machine for processing fuel pump bodies

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Bliss "Packaged" Press Lines

Six lines of enclosed presses are announced by the E. W. Bliss Co., Canton, Ohio. All wiring, piping, and controls—even power and air line take-offs—are built into the uprights. Uncluttered exteriors

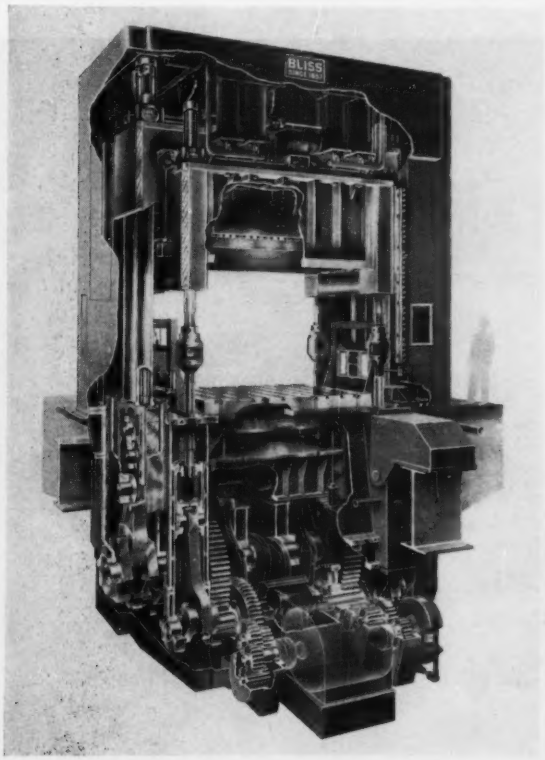

Fig. 1. Bliss underdrive press for low-ceiling plants

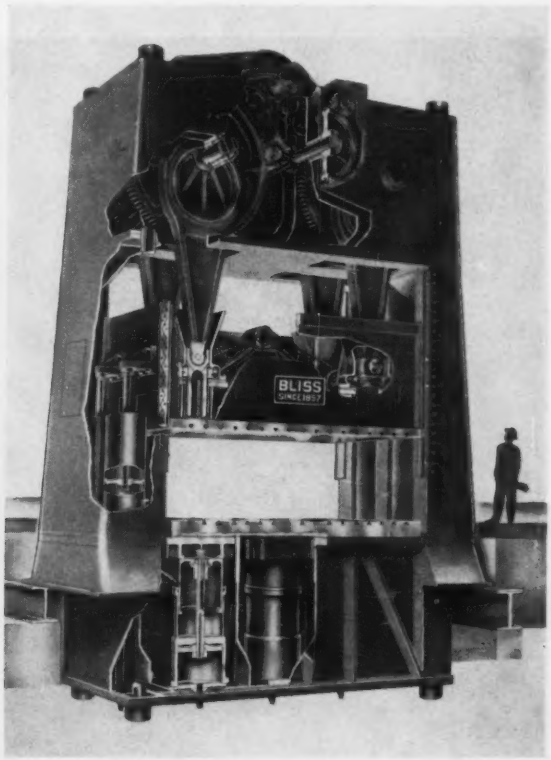

Fig. 2. Bliss 2000-ton four point single-action press

make it easy to equip the presses for automatic feeding and unloading machinery. Cranes can approach the presses without the possibility of snagging overhead pipes. Installation is simplified, since only connections to plant service lines have to be made.

Bed, die, and slide area specifications, and blank-holder and plunger dimensions conform to J.I.C. standards. A TU-4 four-point, triple-action, underdrive press, Fig. 1, has been developed for installation in modern low-ceiling plants. The clutch has been eliminated, the drive being through an electric motor with an interlocked air brake. Crankshafts drive both the plunger and the blank-holder through a simple toggle mechanism. The 2000-ton single-action member of the S-4 line, Fig. 2, is designed for work with deep front-to-rear dimensions. It has four main gears, each with an eccentric gear on one side.

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Baker Special-Purpose Machines for Automobile Production Line

Three special-purpose machine tools manufactured by Baker Brothers, Inc., Toledo, Ohio, are being used in the production of 1955 Packard motor cars. The three machines, all with new automatic features are as follows: a differential carrier processing machine (shown in the illustration); a crankshaft drilling machine; and a flywheel housing finishing machine. The first machine is credited with materially lowering rear-axle production costs. It performs rough-boring, semi-finishing, and finishing operations as well as chamfering and bottoming operations. This double-end trunnion type machine bores the differential carrier from opposite directions simultaneously and to extremely close tolerances. Operation is entirely automatic except for loading and unloading.

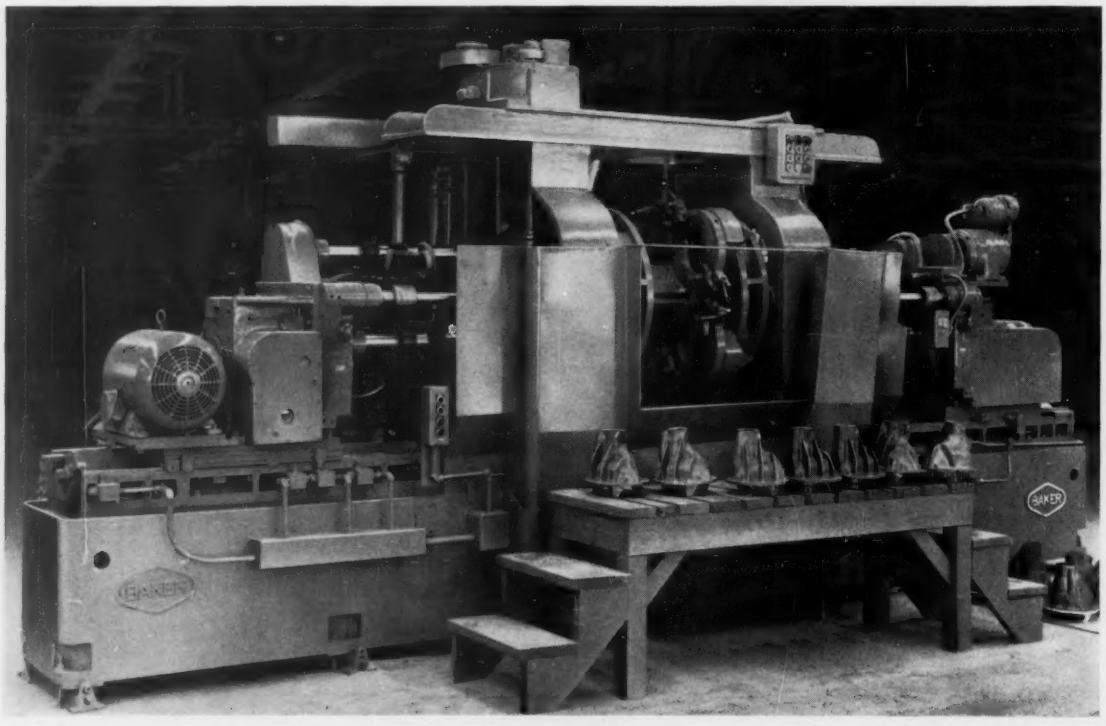
The crankshaft unit is also a double-end, trunnion type machine which drills both the transmission flange end and the fan pulley end of the crankshaft of the V-8 motor. Indicative of the accuracy required of this machine is the fact that it prepares a dowel-hole in the flange end of the crankshaft which pegs the radial location of the shaft when it is ground for finishing. Any variation in the location of this dowel-hole would result in an unbalanced crankshaft. The cycle and index movements of this machine are automatic. Loading, clamping, unclamping, and unloading are performed manually.

The third machine performs all operations required to finish the rough flywheel housing cover, including boring, drilling, reaming, and tapping operations. It has a total of seven vertical and horizontal boring and drilling units mounted around a 72-inch diameter, five-station automatic indexing table. A total of thirty-seven spindles are used to machine all holes in the sides and top of the housing cover. Operation is automatic except for loading and unloading. The electronic controls governing the operation are housed in cabinets almost as large as the 80,000-pound machine itself.

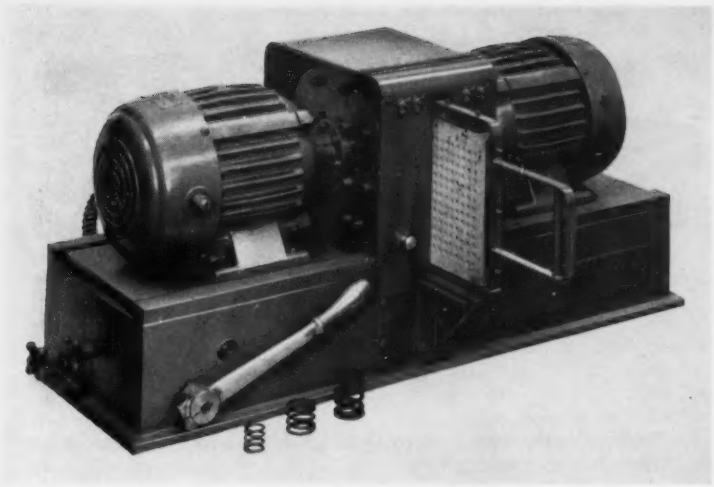
Circle Item 117 on postcard, page 241

Carlson Compression Spring Grinder

A bench-mounted double-end disc grinder, designed to simultaneously grind both ends of compression springs accurately and economically, has been placed on the market by the Carlson Co., New



Machine for processing automobile engine differential carriers built by Baker Brothers, Inc.



Machine for grinding ends of compression springs introduced by Carlson Co.

York City. Production varies with the size and quantity of springs inserted in the grinding frame. For example, 100 small springs with an outside diameter of 3/8 inch and a length of 1 inch made from 1/32-inch music wire can be ground in two to three minutes.

The machine is designed for grinding the ends of compression springs with wire diameters ranging from 0.010 to 0.0625 inch, outside diameters of 1/8 inch to 1 1/2 inches, and lengths of 1/8 inch to 4 1/2 inches.

The springs are inserted in holes drilled into a wood block or into tubes held in a frame which is pushed along a track between the grinding wheels. Depressing the operating handle then causes two opposed wheels to move inward horizontally and grind both ends of the springs.

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Machine for Processing Connecting-Rods

The Cross Company, Detroit, Mich., has announced a special machine for processing connecting-rods. This dial type machine has six stations: one for loading; two for drilling; one for chamfering; and one each for milling and reaming. The machine completes fifty-two operations per part, or a total of 23,400 operations on 450 connecting-rods per hour. It drills, reams, and chamfers the bolt holes, then the piston pinhole; and mills the lock slot.

The index-table is fluid motor-driven and the work-holding fixtures have hydraulic power feed. Electrical and hydraulic construction is in accordance with J.I.C. standards. All standard and special parts are completely interchangeable, a feature which facilitates maintenance and provides flexibility for part design changes.

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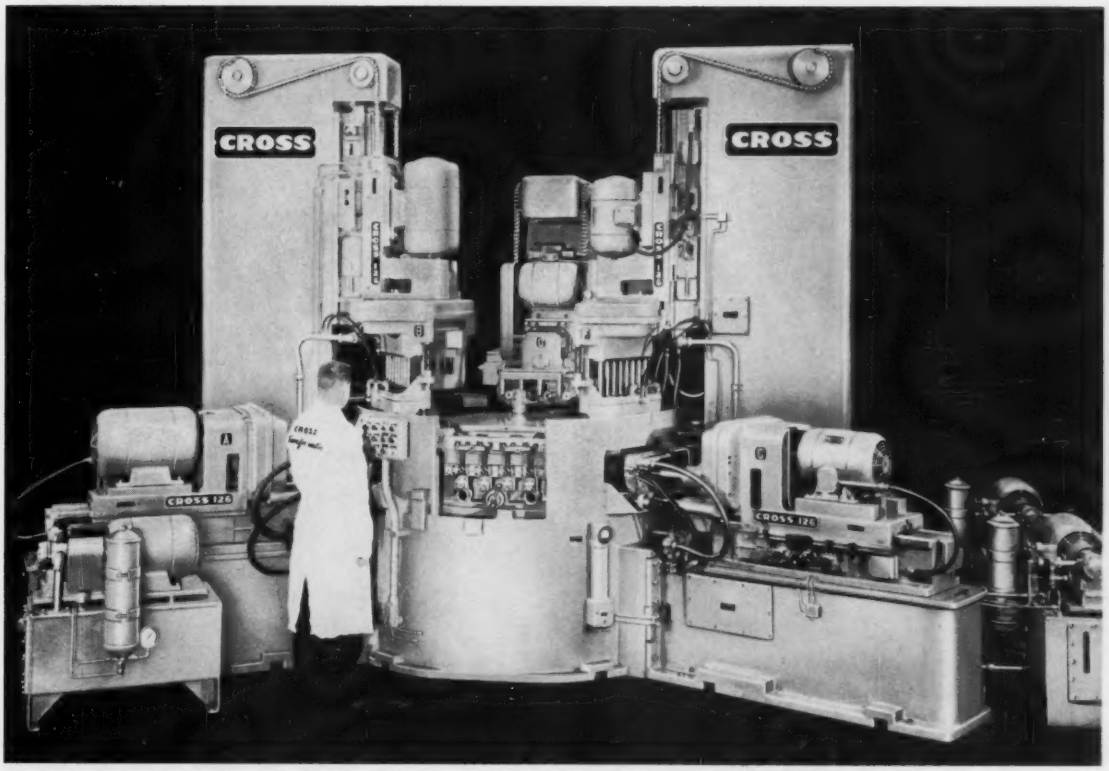


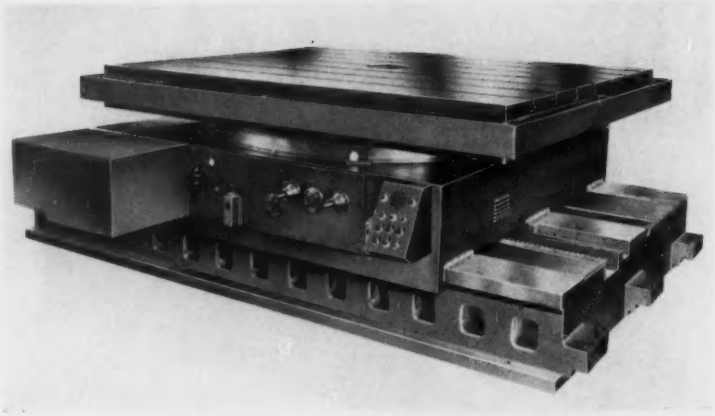
Special connecting-rod processing machine has been brought out by The Cross Company.

Giddings & Lewis Huge Self-Contained Rotary Table

A giant-size precision rotary table, designed to provide additional working area and increased capacity, has recently been added to the line of rotary tables built by the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. Available table sizes include 8-, 10-, and 12-foot round or square platens; and rectangular platens 8 by 10, 8 by 12, and 10 by 12 feet.

The rotary table is a completely self-contained unit having power feeds to the rotating table top as well as longitudinal traverse along the runway. This makes it possible to use the table to move the workpiece at right angles to the runway of a floor type horizontal boring machine and also to perform circular milling and indexing operations in one set-up. The table will handle large work requiring machining to close limits and is adaptable to a variety of work.

All controls are regulated by push-buttons and these, together with the dial for selecting the feed rate, are enclosed within one housing. A dial indicator for indexing the table to predetermined settings is provided. Other features include automatic lubrication; power-operated clamps for the table and runway; non-metallic way bearing surfaces for both the table and base to minimize scoring; and scraped runways to facilitate smooth and accurate handling of heavy work. Runways can be built in 2-foot increments from 12 to 22 feet long with 4 to 14 feet of travel. Power is supplied by a 7 1/2-H.P. motor for the feed movements and a 3/4-H.P. hydraulic motor for shifting clutches, clamping, and supplying lubrication for rotating parts.



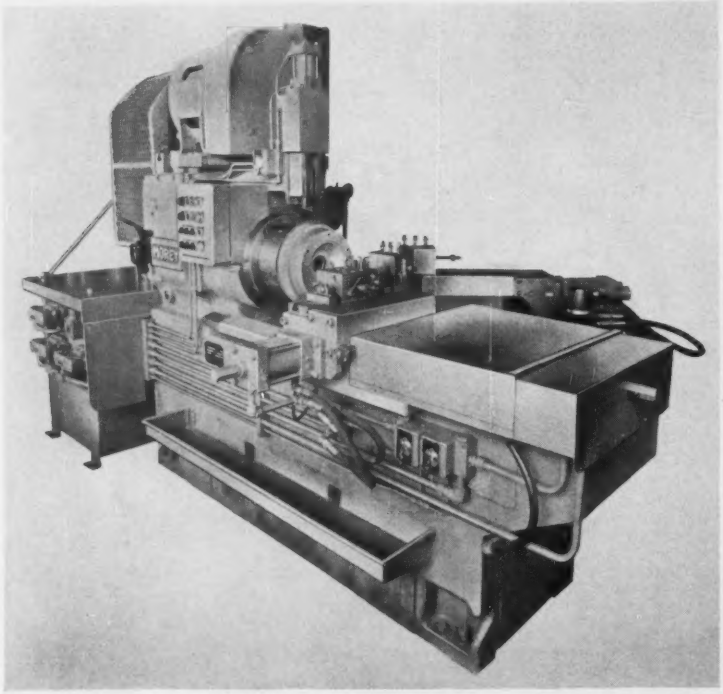
Precision rotary table built by Giddings & Lewis Machine Tool Co.

Circle Item 120 on postcard, page 241

Morey Special Semi-Automatic Lathe

A special semi-automatic lathe for machining aircraft landing wheels has been developed by the Morey Machinery Co., Inc., New York City. This lathe machines the complete landing wheel, with the exception of the hub, in one operation. The machine is hydraulically operated and electrically controlled, with an overhead slide and a cross-slide on which a tracing slide is mounted.

The wheel is held in a hydraulic chuck. The tracing slide quickly advances and turns the contour on the outside surface and flange of the landing wheel. As soon as the contour is finished, the overhead slide and two other tools (mounted on the cross-slide) machine both surfaces of the landing wheel and knurl the flange simultaneously. The floor-to-floor time for a 14-inch landing wheel is less than one minute. The machine has a capacity for turning wheels up to 18 inches in diameter.



Semi-automatic lathe placed on the market by the Morey Machinery Co., Inc.

Circle Item 121 on postcard, page 241

Onsrud Carbide-Tipped Step Cutter

A carbide-tipped step cutter, recommended for wood, plastic, and non-ferrous metals, has been placed on the market by the Onsrud Cutter Mfg. Co., Libertyville, Ill. High-grade carbon steel for the cutter body and a proved grade of carbide for the cutting edges, are used in manufacturing these cutters. They may be re-

tipped at nominal cost when dull.

The cutters are staggered on the spindle to form steps, providing intermittent cuts that allow fast feeds, yield smooth finishes, and reduce machine spindle strain. Any desired height of cutters may be stacked. They can be ground with side clearance and used for slotting, grooving, and similar operations.

Circle Item 122 on postcard, page 241

Lincoln "Idealarc" All-Purpose Welder

The Lincoln Electric Co., Cleveland, Ohio, has introduced a new universal, combination arc welder which provides a choice of alternating or direct current, and a soft or forceful arc. The machine, called the "Idealarc," is said to provide an ideal type of welding arc for all types of manual welding applications.

The machine is available in several combinations. It can be obtained as an alternating-current welder only, although a direct-current package can be easily attached in about one hour. It is also available as a combination machine. Different output capacities of alternating and direct current can be combined to fit the machine to the job requirements. The machine thus can be quickly set for maximum efficiency on all types of welding, including the welding of ferrous or non-ferrous materials, sheet metal, or heavy plate.

In addition to dual control of the arc, the Idealarc machine has an arc booster switch for selecting either normal or "hot" starting. The switch enables efficient performance on different types of materials, and of varying thicknesses, and under different joint conditions. Models now available have ratings of 300, 400, and 500 amperes alternating current combined with direct-current welding ratings of 200, 300 375, and 450 amperes.

Circle Item 123 on postcard, page 241

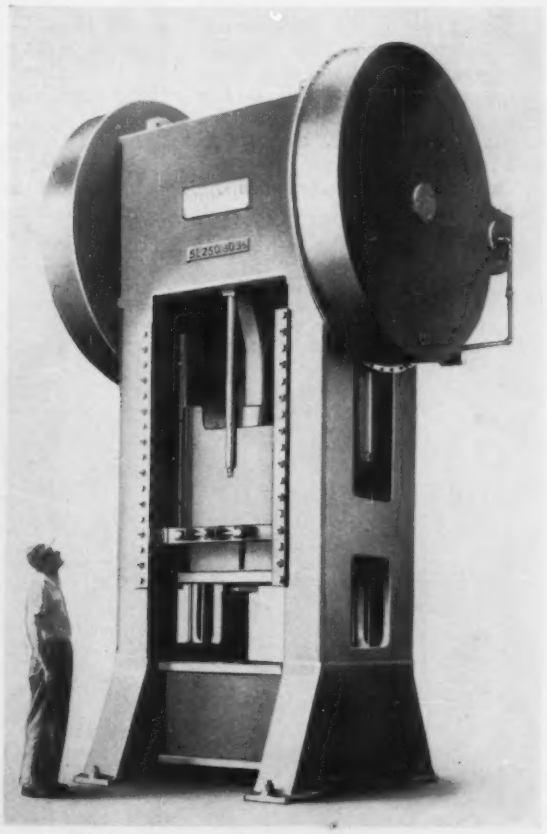
Steelweld Twin-Geared Single-Point Straight-Side Press

The Cleveland Crane & Engineering Co., Wickliffe, Ohio, is introducing a line of twin-geared Steelweld single-point presses of the straight-side tie-rod type. These machines, of welded steel construction, are mechanically powered and incorporate the latest features to insure safety and dependability, including a low-inertia air-operated clutch and brake unit; barrel type adjustment; non-metallic, non-scoring guides; and provision for applying automatic lubrication.

The machines are available in sizes ranging from 150 to 500 tons and have bolster areas of 30 by 36 inches to 42 by 48 inches. Operating speeds are from ten to twenty strokes per minute. Presses with other specifications can be designed and built in order to accommodate specific requirements of the user.

Circle Item 124 on postcard, page 241

"Idealarc" all-purpose welder brought out by the Lincoln Electric Co.



Steelweld 250-ton single-point press built by the Cleveland Crane & Engineering Co.

Snyder machine for processing automotive exhaust manifolds

Snyder Special Automatic Machine for Processing Exhaust Manifolds

A special automatic six-station machine for processing automotive exhaust manifolds is announced by the Snyder Tool & Engineering Co., Detroit, Mich. This machine is equipped to mill and drill holes in the joint faces, and mill and tap holes in the exhaust flange of the castings, which are 21 inches long and irregular in shape.

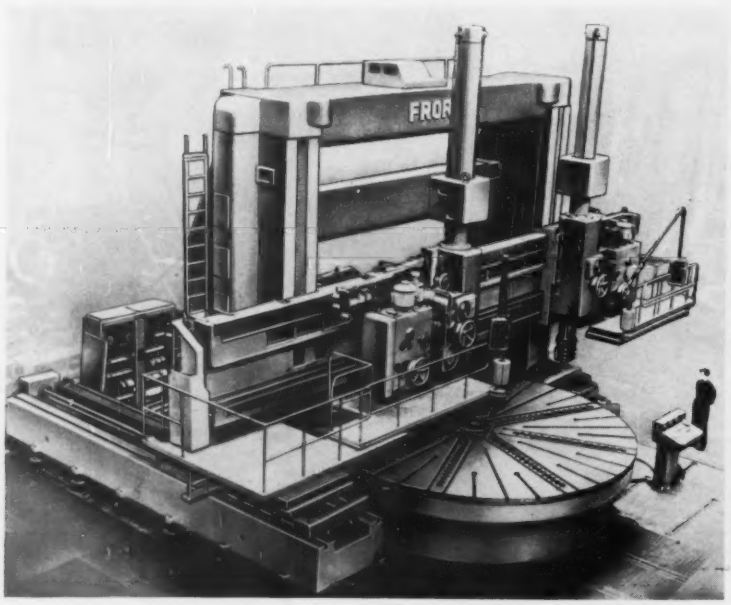
The manifold is loaded into the fixture at the first station with the joint faces up and resting on pads at either end and against back stops. The exhaust flange neck is placed in a V-block for endwise location. Jacks supporting the part are hydraulically operated, as are the clamps which hold it in position.

At the second station, the three joint faces of the part are milled by a vertical three-spindle milling head carried on a hydraulically operated slide unit. The stub type spindles in this head are mounted in pre-loaded taper roller bearings and driven through a worm and worm-wheel. At the third station, the exhaust flange face is milled by a horizontal, single-spindle milling head of similar design, while at the fourth station the exhaust neck is bored by a single-spindle boring head.

A six-spindle vertical drilling head with a spring-loaded bushing plate drills four 0.4687-inch holes and two 0.406-inch holes; and a horizontal drilling head taps, drills, and countersinks two 0.406-inch holes and two 3/8-16 holes at the fifth station. The sixth station taps two holes in the exhaust flange. The spindles in this head are of the individual, lead-screw type, mounted in ball bearings. The hardened and ground steel lead-screws run in bronze nuts and are designed for safety tap drivers.

The carbide milling cutters operate at 250 surface feet per minute, and the high-speed steel drills at 80 surface feet per minute. The 60-inch index-table carrying the six work-holding fixtures is operated automatically by a fluid drive mechanism. Electrical interlocking throughout protects both operator and machine. The work cycle is twenty-five seconds, giving a production of 115 pieces an hour.

Circle Item 125 on postcard, page 241



Froriep vertical boring and turning mill introduced by the Cosa Corporation

Vertical Boring and Turning Mill

Double-column vertical boring and turning mills built by Froriep, Rheydt, Germany, to obtain high cutting capacity and precision production with carbide tools and easy operation are being introduced in this country by the Cosa Corporation, New York City. These boring mills are manufactured in standard sizes with table diameters ranging from 80 inches to 32 feet, and with work load capacities from 6 to 160 tons. Larger sizes can also be built to suit specific requirements.

Feeds are provided by motors on the saddles which are electrically controlled to meet the requirements for rough- and finish-machining. The horizontal feed is through a helical pinion to a rack mounted on the cross-rail. Thread-cutting is provided through change-gears coordinated with the synchronized electrical transmission. Centrally located pendants provide low-voltage electric re-

mote control for all feeds and rapid traverses, including regulation of speeds and speed groups.

The large table spindle is housed centrally in adjustable roller bearings which take all transverse or radial loads. An adjustable ball thrust bearing prevents excessive loading of the table bearing surface.

Lubrication control is automatic, and warning signals indicate disturbances within the oil circulating system. The table ways are provided with thermal temperature controls, and acoustic and optical devices warn of excessive temperature rise. The speed range ratio is 1 to 100.

Circle Item 126 on postcard, page 241

Automatic Cycle Brushing Lathe

The Standard Electrical Tool Co., Cincinnati, Ohio, has announced an automatic brushing lathe designed primarily for deburring both face edges of gear or sprocket teeth simultaneously. Two wire brushes, each 12 inches in diameter, are used for this operation, which can be performed on gears or sprockets from 3 to 10 inches in diameter. The wire brushes are brought to the work by a power cylinder and allowed to dwell for a predetermined period. An adjustable traverse stop is provided.

After the deburring operation is completed, the wheel-head is automatically traversed to the starting position, and the wheel and work motors stopped. Automatic reversal of rotation at the completion of each cycle serves to prolong the life of the wire brushes. The machine requires a floor space 50 by 23 inches and is 49 inches high.

Circle Item 127 on postcard, page 241

Landmaco Pipe- and Nipple-Threading Machine

A double-spindle Landmaco machine has been designed by the Landis Machine Co., Waynesboro, Pa., for the production threading of pipe and nipples from 1/8 to 3/4 inch in diameter. The tangential chaser threading heads furnished with the machine are equipped with reamer attachments which permit threading, reaming, and chamfering operations to be performed simultaneously. These heads also have internal trip mechanisms which assure uniform thread lengths regardless of normal differences in the nipple length or in the gripping position.

The machine has five spindle speeds ranging from 133 to 310 R.P.M. With these speeds, each of the five pipe diameters within the range of the machine can be threaded at the most efficient speeds. Additional speeds are available for special applications.

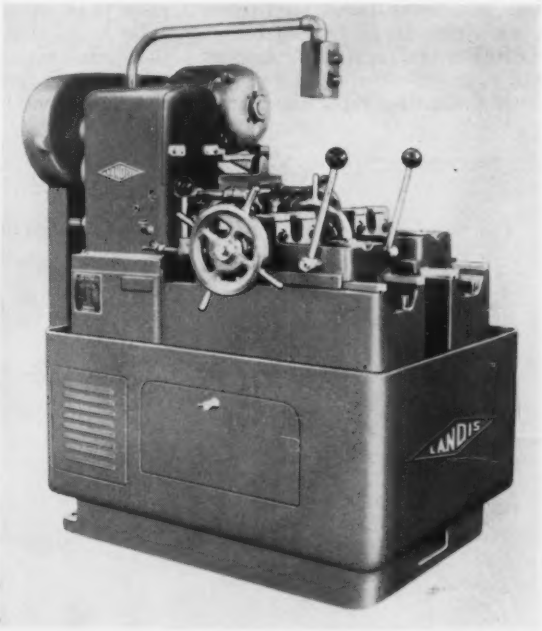
The machine bed is especially designed for easy operation and is equipped with replaceable hardened and ground ways for guiding and supporting the carriage. The carriages are operated by levers and provide a 6-inch travel. A hammer-blow type handwheel, which intensifies gripping power without operator fatigue, is used to operate the carriage vise. The vise is adjustable, both horizontally and vertically, to assure proper work alignment with the die-head. The starting and stopping push-button station is mounted on a pivoted arm that can be moved conveniently to either side of the machine.

Circle Item 128 on postcard, page 241

Producto Guide-Pin Lubricators

A device to prevent the seizing and galling of die-set pins and bushings has been introduced by the Producto Machine Co., Bridgeport, Conn. The flexible units fit tightly around the pins and serve as reservoirs for lubricating oil.

Automatic cycle brushing lathe announced by the Standard Electrical Tool Co.



Pipe- and nipple-threading machine brought out by the Landis Machine Co.

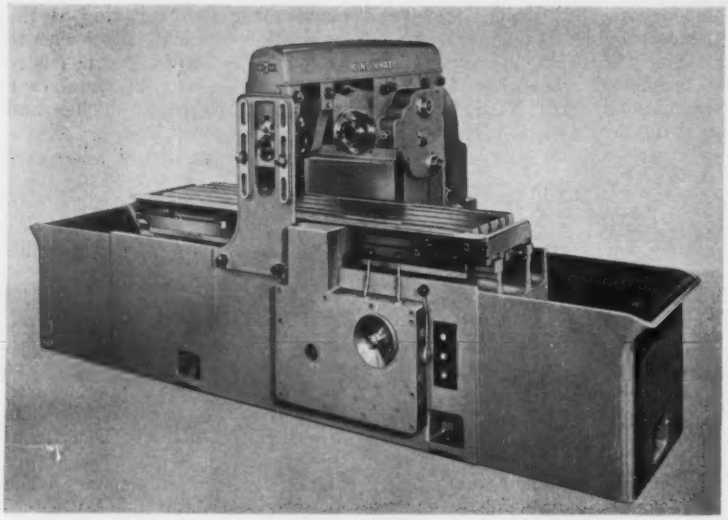


Fig. 1. Cincinnati HyPowermatic heavy-duty milling machine

At each stroke of the press, the guide bushings dip into the reservoir, thus coating the entire guide pin with lubricant. The units are made of specially compounded materials to withstand regular lubricating oils without softening or cracking. They are also highly resistant to heat and abrasion.

Circle Item 129 on postcard, page 241

Cincinnati HyPowermatic Milling Machines

A line of HyPowermatic bed type milling machines has been developed by the Cincinnati Milling Machine Co., Cincinnati, Ohio. These heavy-duty machines are equipped to permit the use of automatic two-way table feed cycles and infinitely variable feed rates. They are designed for continuous operation and are much heavier and more powerful than previous models. Cutting capacities range up to 50 H.P., and spindle speeds up to 2000 R.P.M. Conventional milling or climb-milling cuts can be taken with either high-speed steel or sintered carbide cutters.

The 300, 400, and 500 series comprising this line are built in plain and duplex styles. Each style is made in forty-two sizes, the smallest having a 36-inch table travel and a 7 1/2-H.P. motor, and the largest, a 168-inch table travel and a 50-H.P. motor. Intermittent automatic table cycles are dog-controlled and the feed rates may be infinitely varied by selector dials throughout the complete range of 1/4 inch to 100 inches or to 150 inches per minute, depending upon the size of the machine.

Quick, positive starting and stopping of spindle rotation are obtained through two hydraulically operated multiple-disc clutches. Sixteen spindle speeds can be obtained through the change-gears and a back-gear. Nine different ranges of spindle speeds are available. The highest speed range for the 300 series spindle-carriers is from 50 to 2000 R.P.M.; for the 400 series, from 30 to 1200 R.P.M.; and for the 500 series, from 20 to 800 R.P.M. A hydraulic counterbalance facilitates raising and lowering the spindle-carriers.

Circle Item 130 on postcard, page 241

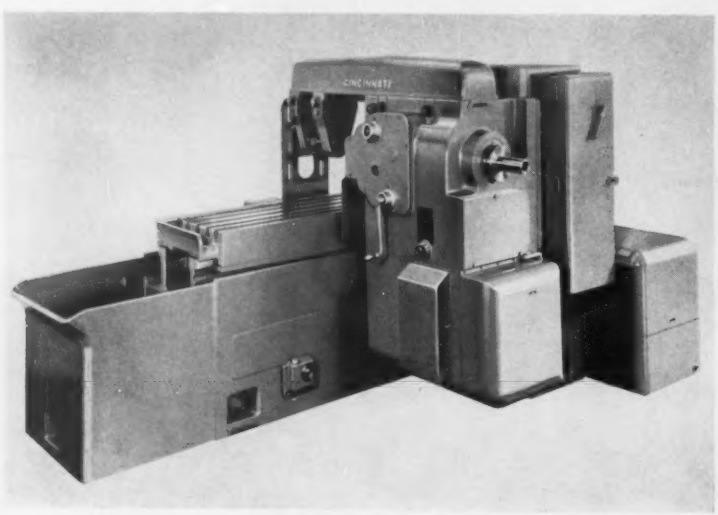


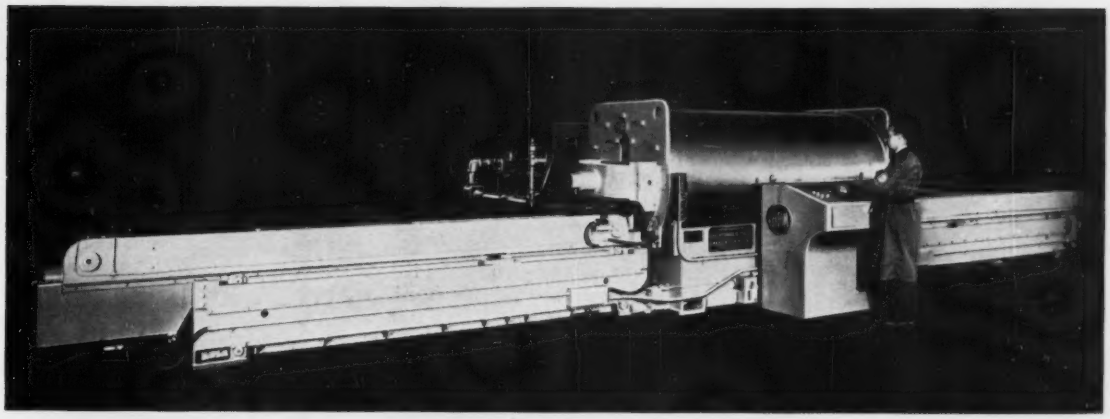
Fig. 2. Rear view of HyPowermatic machine shown in Fig. 1

H-P-M Diaform Press of Improved Design for Guerin Process

Improved high-pressure metal forming presses for the Guerin process have been placed on the market by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio. Two models of this press now in production have capacities of 10,800 and 19,500 tons. These presses are adapted for use when inexpensive tooling is a prime requirement due to small production runs and frequent design changes.

The presses consist essentially of a barrel-like steel container in which there is a rubber diaphragm and a rubber pad. The diaphragm is positioned over the pad. When hydraulic fluid is pumped into the diaphragm, pressure is exerted on the pad, forcing it down over the form-blocks. After the forming operation, the oil is pumped from the diaphragm, and the sliding table containing the formed parts is removed from the press. Titanium and other metals difficult to shape can be handled.

The Diaform press features two reciprocating tables that operate alternately from each side of the pressure housing. The tables are actuated laterally by a fluid motor drive through a dual chain conveyor to positive stops. At the proper position, the table stops and is automatically raised so that the work is positioned directly under the rubber pad facing. The



Diaform press of improved design has been brought out by the Hydraulic Press Mfg. Co.

table is rigidly supported and locked in this position by filler plates that are actuated by a double-acting hydraulic cylinder.

All motions are hydraulically cushioned to prevent the misplacement of work on the table. After the work is completed, the table is automatically lowered and retracted to the extreme position outside the press, the other table being automatically advanced to the pressing position.

Circle Item 131 on postcard, page 241

Sheffield-Murchey Thread-Rolling Attachment

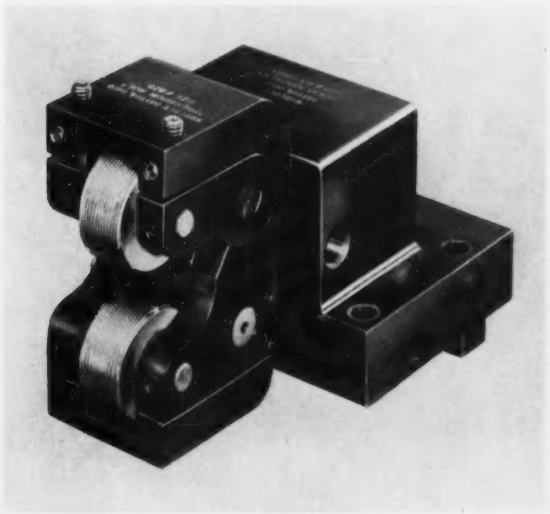
Right- or left-hand straight or tapered threads and annular or helical grooves can be produced in many materials by the "Precision-Rol" thread-rolling attachment introduced by the Murchey Division of the Sheffield Corporation, Dayton, Ohio. Knurling and burnishing can also be performed. Four sizes are available, each with a wide range of diametral adjustment. Rolls are easily installed in the head of the device and are set by a single screw. The head pivots in its adapter, permitting the rolls to center themselves over the work.

Circle Item 132 on postcard, page 241

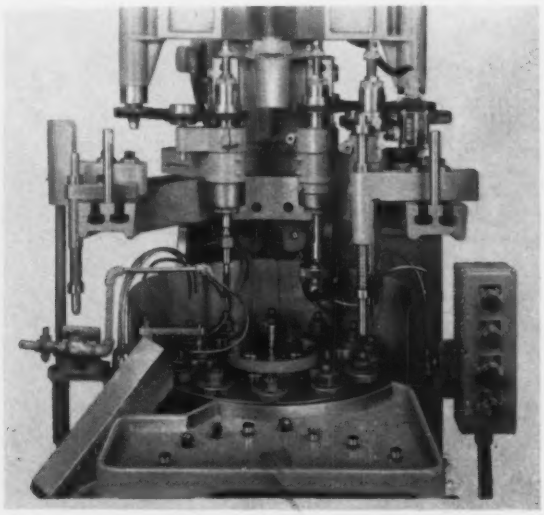
Bodine Automatic Multiple-Spindle Machine for Processing Motor Commutators

An automatic, multiple-spindle machine designed to turn out 1070 small-motor commutators in fifty minutes has been placed on the market by the Bodine Corporation, Bridgeport, Conn. The operations performed in processing the commutator include hand feeding; inspecting automatically for positioning; carbide-reaming center shaft hole in plastic to a diameter of 0.3145 to 0.3165 inch; hollow-milling outside diameter to 0.691 to 0.693 inch, using piloted carbide hollow mill; facing plastic shoulder with carbide tool piloted in reamed hole; and automatically ejecting work.

The carbide tools are said to maintain high production speeds and give long tool life when machining extremely abrasive mate-



Thread-rolling attachment introduced by Murchey Division, Sheffield Corporation



Automatic machine built by the Bodine Corporation for rapid processing of motor commutators

rials. They also maintain close tolerances on machining operations. While the Model 41-20 machine illustrated was tooled as a straight driller, it may also be tooled for tapping, milling, single- or double-screw inserting, and assembling operations.

Circle Item 133 on postcard, page 241

Kesel Automatic Circular Dividing Machine

The George Scherr Co., New York City, is introducing in this country a Georg Kesel circular dividing machine for cutting the graduations on precision scales. This machine is completely automatic in operation and is adapted for production work. It is started by a push-button and stopped automatically by a revolution counter which is pre-set for the number of lines to be cut. The machine will cut up to 100 lines per minute.

Of large capacity (approximately 40 inches) and rugged construction, this machine will accept heavy loads without affecting its accuracy in handling small work such as graduated collars. An extra hand-operated attachment is available for producing linear divisions on flat surfaces.

Circle Item 134 on postcard, page 241

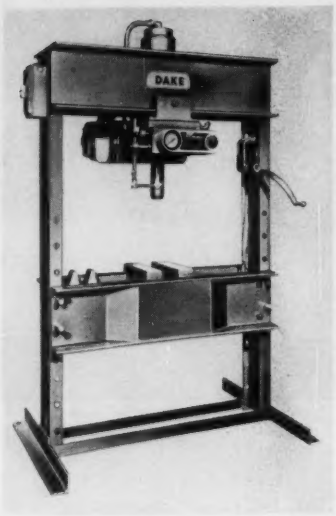
Avey Automatic Machine Designed to Mill Slots in Jet-Engine Part

An automatic machine designed to mill eighty-eight slots in the periphery of a stainless-steel jet-engine case weldment has been built by the Avey Drilling Machine Co., Cincinnati, Ohio. The machine consists of a standard No. 2 Avey automatic cam feed unit vertically mounted on a fabricated steel column, and an automatically indexed work-table.

The columns of the machine carrying the cam feed milling unit can be traversed horizontally by hydraulic power to provide clearance for removing and loading the part. The vertical column assembly also has hydraulic power rapid traverse downward to the work. From this point, an automatic cam feed unit controls the processing.

The index-table ring of this machine can be removed and a new ring of a different index pattern can be installed, or the index locators can be installed in a different fixture baseplate so that rapid changeover from one fixture to another may be accomplished without any change in the index mechanism.

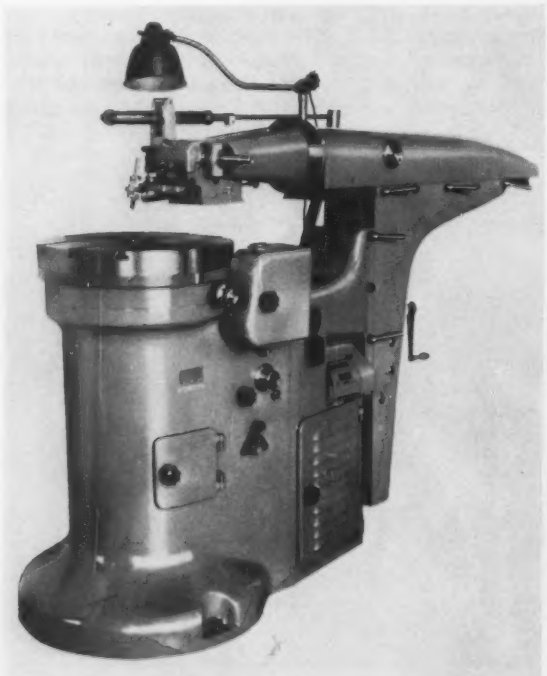
Circle Item 135 on postcard, page 241



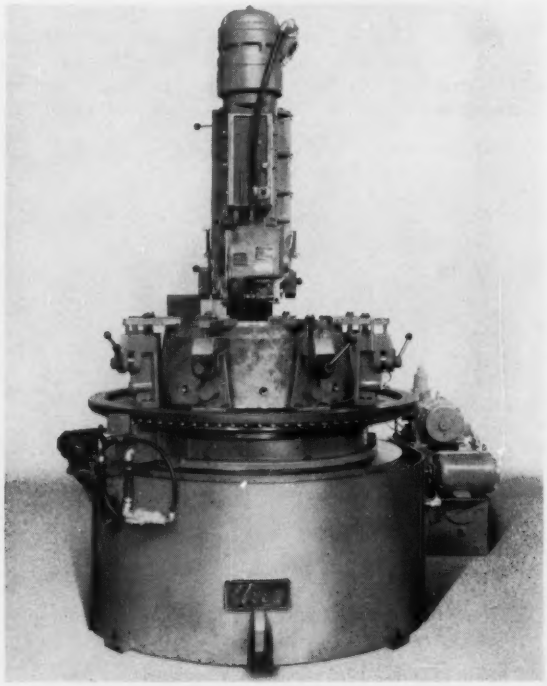
"Elec-Draulic" shop press announced by the Dake Engine Co.

Dake "Elec-Draulic" Shop Press

An electric-hydraulic shop press called the "Elec-Draulic" has been brought out by the Dake Engine Co., Grand Haven, Mich. A feature of special interest is the rapid ram approach which eliminates the use of a handwheel. When the control



Automatic circular dividing machine introduced by the George Scherr Co.



Avey automatic machine equipped for slotting jet-engine case weldments

knob is turned, the ram advances at high speed until it comes in contact with the work and then automatically changes to the power stroke.

The speed of the ram is variable under fingertip control. The knob automatically returns to the "off" position when the operator's hand is removed. All controls and gages are placed at convenient working height, in a streamlined control panel.

The work-head is self-contained, and is readily movable on needle bearings to permit centering over the work. The ram has a full 10-inch stroke. The work-head unit may be purchased separately when desired.

Circle Item 136 on postcard, page 241

U. S. "Multi-Roll" Cradle

The Model ACC-1-9-C automatic coil cradle of the U. S. Tool Co., Inc., Ampere (East Orange), N. J., has been brought out for users who wish to replace stock reels. It can accommodate coils having a width of 9 inches, an outside diameter of 40 inches, and a weight of 1000 pounds. There are four power-driven coil rest rolls arranged in an arc to equalize weight distribution. A pair of take-out rolls, which are power-driven and spring-loaded, control the unwinding of the material to the very end of the coil. These rolls are swung out of the way when loading a new coil. A 1/3-H.P., 150-R.P.M. geared motor provides output speeds up to 80 feet per minute. Faster speeds can be obtained by equipping the cradle with other motors to suit requirements.

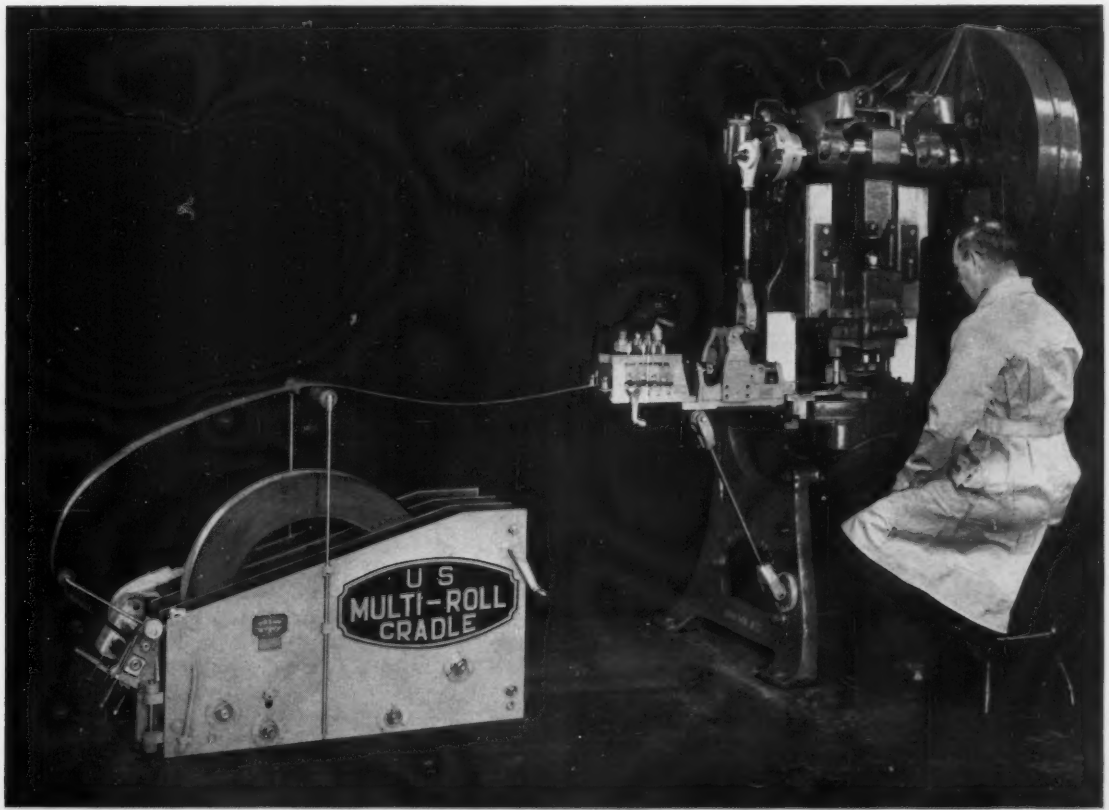
Circle Item 137 on postcard, page 241

Raceway pilotor of the Micrometrical Development Corporation

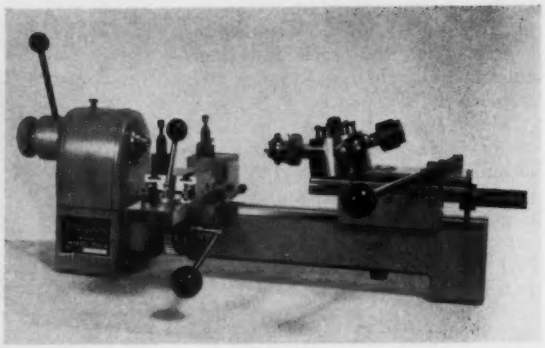
"Pilotor" Measures Raceway Roughness

The Micrometrical Development Corporation, Ann Arbor, Mich., has announced a Profilometer race-groove "pilotor" for measuring surface roughness across the raceways of small ball bearings. This device accommodates inner and

"Multi-Roll" cradle added to the line of the U. S. Tool Co., Inc.



Swiss-made Wyler precision Micrometric spirit level

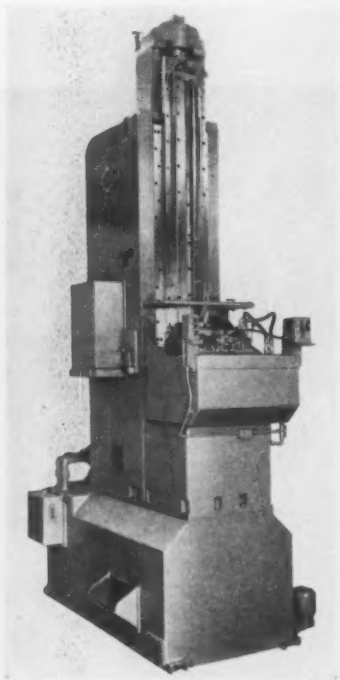


Precision instrument lathe made by F. W. Derbyshire, Inc.

outer races of bearings from 5/16 to 1 inch outside diameter. On other parts, it can be used for measuring surfaces having a radius from 1/32 to 1/4 inch.

The work to be measured is supported in an adapter on a horizontal spindle that reverses automatically at each end of the oscillating movement. The work is held so the center of curvature is on the axis of spindle rotation. As the work oscillates, the point of a stationary tracer contacts the surface. An amplimeter unit connected to the tracer indicates the roughness in micro-inches, r.m.s.

Circle Item 138 on postcard, page 241



Colonial single-ram, long-stroke vertical broaching machine

Wyler Micrometric Level

A Swiss-made precision "Micrometric" spirit level is being introduced by Max Wyler, New York City. This spirit level allows direct inclination readings in thousandths of an inch by means of a micrometer screw located on one end of its 4 3/4-inch length. Finer measurements, to 0.0001 inch, may be obtained from the displacement of the bubble. Sensitivity of the level ranges from 0.0002 to 0.001 inch per 10 inches.

Insulating handles are provided with the level to prevent any disturbance in accuracy due to the contact of body warmth during use. The precision spirit level is used principally for checking the scraping of machine tool ways.

Circle Item 139 on postcard, page 241

Colonial Long-Stroke Broaching Machine

Single-ram, vertical broaching machines of the RS series are now being built by the Colonial Broach Co., Detroit, Mich., with a 90-inch stroke in 15- and 25-ton capacities. These machines are especially adapted for use in the production of jet-engine parts. Single-pass broaching with these machines is said to have advantages from the standpoint of time and cost.

Maximum ram speeds for the 15- and 25-ton models are, respectively, 30 and 20 feet per minute for the cutting stroke, and 60 and 40 feet per minute for the return stroke. The cutting stroke is adjustable to suit the operation. The machine may be interlocked with other machines performing previous and subsequent operations. Nine other models in the line have capacities from 6 to 25 tons.

Circle Item 140 on postcard, page 241

Precision Instrument Lathes

A small precision instrument lathe, one of a new series brought out by F. W. Derbyshire, Inc., Waltham, Mass., has a live-spindle run-out of less than 0.0001 inch at a distance of 1/2 inch from the ball-bearing equipped headstock. The lathe has a lever type collet closing arrangement, V-belt drive, six-position tail turret, a double-compound slide-rest with a rack-and-pinion cross-slide, and a front toolpost having a swing of 360 degrees.

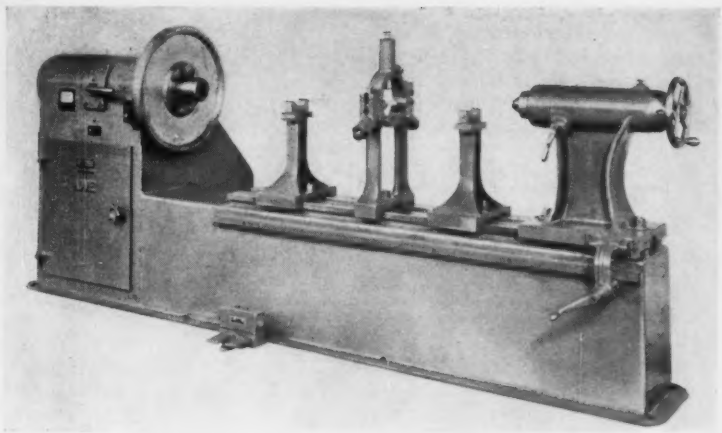
The lathe has an over-all length of 24 inches with a bed length of 22 inches and a swing of 5.905 inches. With a pulley ratio of 1 to 1, a variable-speed drive permits the selection of any speed ranging from 590 to 4700 R.P.M. If a pulley with a ratio of 2 to 1 is used, spindle speeds ranging from 1180 to 9400 R.P.M. are available.

Circle Item 141 on postcard, page 241

Acme Special Speed Lathe for Polishing Axle Shafts and Torsion Bars

A special horizontal speed lathe built by the Acme Mfg. Co., Detroit, Mich., originally for manually removing defects from jet-engine compressor wheels, is now available to the automotive industry for use in polishing axle shafts, torsion bars, and various other parts. The machine can be furnished with a spindle nose to suit work requirements. A combination flywheel and handwheel provides for uniform rotation and permits manual turning of the work-spindle.

A special reduction unit provides stepless spindle speeds ranging from 50 to 300 R.P.M. so that the same surface speed is main-



Special speed lathe for polishing axle shafts and torsion bars built by the Acme Mfg. Co.

tained in working from the inner to the outer surface of a large-diameter piece. Work-rests and steadyrests can be provided. The machine is 130 inches long, 37 inches wide, and 52 inches high.

Circle Item 142 on postcard, page 241

High-Speed Single-Point Carbide Tool Grinder

A single-point carbide tool grinder, designed to operate at a speed of 10,800 R.P.M. and to combine rough and finish grinds in one high-speed operation, has been developed jointly by Ohio Metal Working Products Co., Cleveland, Ohio, and the Metalloid Corporation, Huntington, Ind. The high speeds at which this HI-V grinder operates are said to have been made practical by the development of the all-metallic grinding wheel to which abrasive diamonds are bonded by electrolytically deposited nickel.

A frequency converter provides wheel-spindle speeds of 10,800 and 3600 R.P.M., with both right- and left-hand rotation. The lower speed is provided for use in forming radii or doing other profile-forming work that would be difficult to perform at the higher speed because of the rapid rate of stock removal.

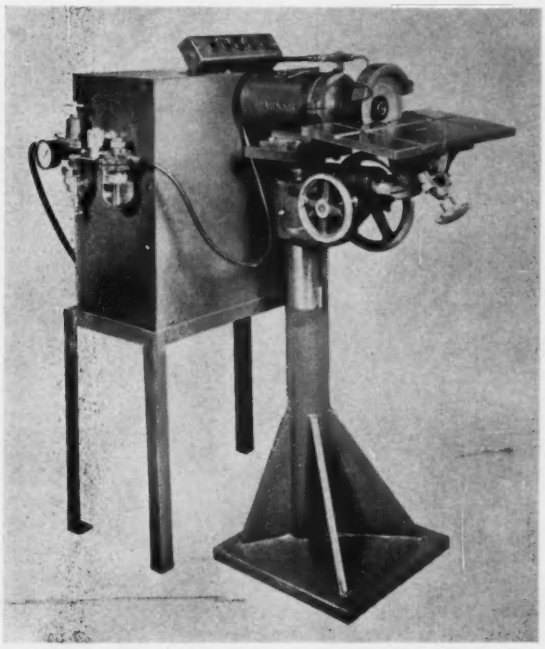
A built-in Metalloid applicator automatically supplies vapor to the wheel and work through four outlets in the wheel guard. Wheels of 80, 100, 120, 150, 170, and 200 grit are now available for this tool grinder.

Circle Item 143 on postcard, page 241

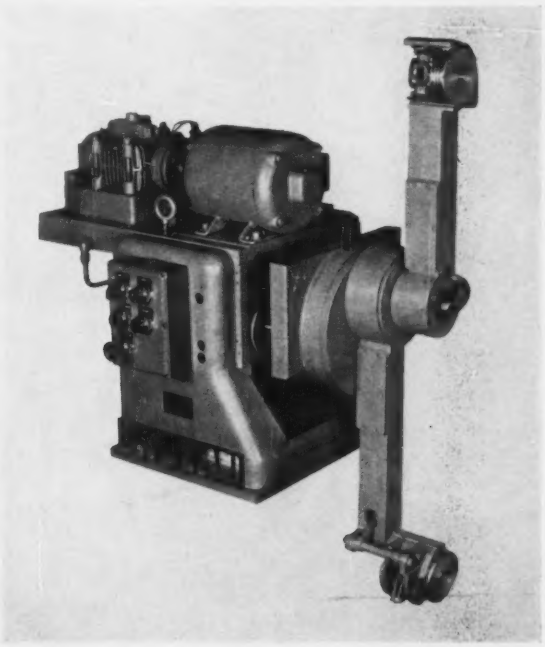
Automatic Work Loader Designed for Automation of Existing Equipment

An automatic work loader and unloader for machine tools is announced by the Hautau Engineering Co., Ferndale, Mich. This loader is the latest addition to the company's line of equipment designed for the automation of standard production tools. It is particularly adaptable to use with horizontal spindle machines such as lathes and grinders. Being compact—only 16 by 16 by 32 inches—it can be used where space between machines is limited.

The loader feeds a part to the machine from an incoming conveyor or a preceding machine and simultaneously removes the fin-



HI-V carbide tool grinder announced by the Ohio Metal Working Products Co.



Hautau automatic work loader and unloader developed for use with machine tools

ished part and transfers it to an outgoing conveyor. This is accomplished by two arms which swing through 180-degree arcs about a central axis and carry work clamps on their outer ends. While one arm is unloading a finished part, the other arm is picking up a new part from the incoming conveyor. The loader can be mounted either on its own heavy cast base or directly on the machine or conveyor.

Circle Item 144 on postcard, page 241

Diebel Automatic Double-Crank Presses

A double-crank Diebel high-production automatic press of welded steel construction is being introduced by the Di Machine Corporation, Chicago, Ill. This press has feed rolls 10 inches wide and is available in three capacities measuring 30, 37, and 45 inches between uprights. The speed range is from 80 to 240 strokes per minute.

A cylindrical type ram, which is designed to insure accurate alignment, and a balanced crankshaft are features of this press. Air-clamped feeds prevent stock distortion and permit positive feeding. Standard equipment includes air counterbalances; an automatic metered lubrication system; complete electrical controls; an air clutch; and specially designed mounts developed to absorb shocks.

Circle Item 145 on postcard, page 241

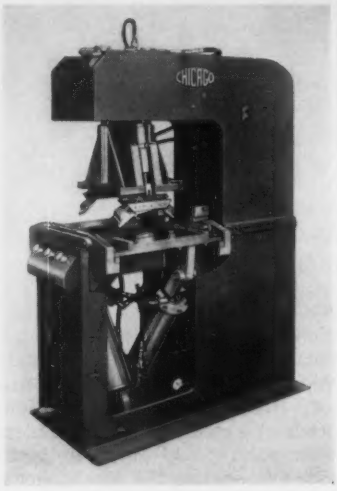


Fig. 1. Double-wing Chicago folder brake with open throat and fixed head announced by the Dreis & Krump Mfg. Co.

Fig. 2. Double-wing folder brake with open throat and moving head

Chicago Double-Wing Folder Brakes

Three new models of Chicago folder brakes have been announced by the Dreis & Krump Mfg. Co., Chicago, Ill. They are made in a single-wing model; a double-wing model with an open throat and fixed head (Fig. 1); and a double-wing model with an open throat and moving head (Fig. 2).

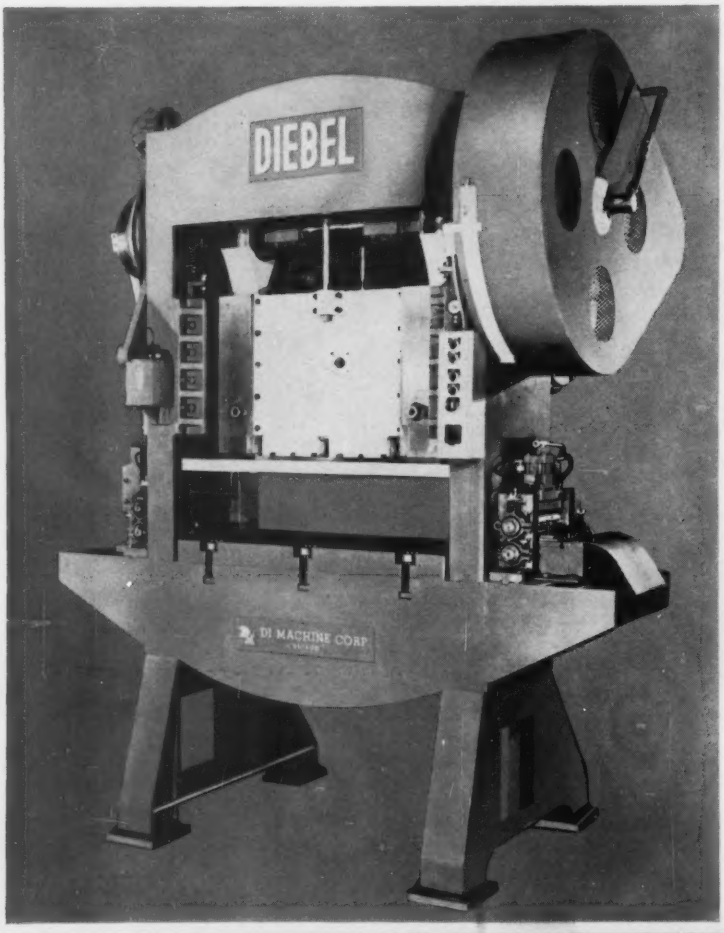
These machines are custom-built to meet individual requirements for length of bend, distance between bends, and sharp or round bends with or without flanges, offsets, or beads. Any of these folder brakes may be supplied as a single-purpose machine or to handle a variety of sizes or products. Pneumatic, hydraulic, or mechanical operation is offered. Some of the advantages claimed for these machines are rapid and accurate production, simplicity of design, and a fully automatic operating cycle.

Circle Item 146 on postcard, page 241

Wales Hydra Springs

A new line of semi-standard Hydra Springs has been announced by the Hydra Spring Division of the Wales-Strippit Corporation, North Tonawanda, N. Y. This line is the result of shortening the chambers of standard Hydra Springs to obtain a wider range of applications. Performance of the springs is the result of utilizing the compressibility of special fluids called "Comproils."

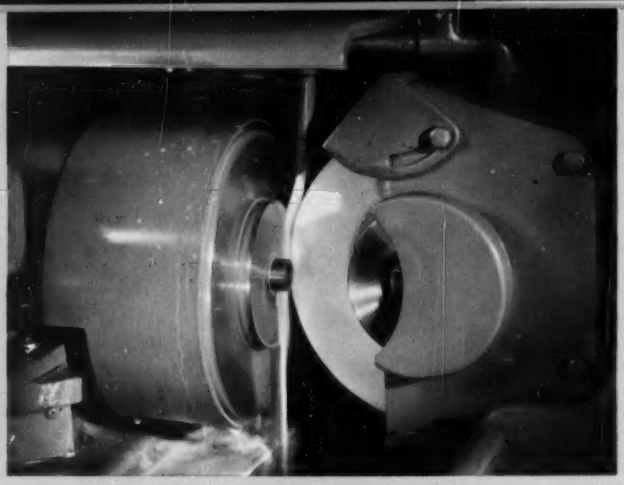
Force and stroke of the springs



Automatic double-crank press placed on the market by the Di Machine Corporation

A BRAND-NEW ANGLE!
Horizontal-Spindle
Face Grinding Machine
by Brown & Sharpe
(see next page)
BROWN & SHARPE

New-Type Brown & Sharpe Face Grinding Machine Combines **Exclusive** Operating and Production Features!



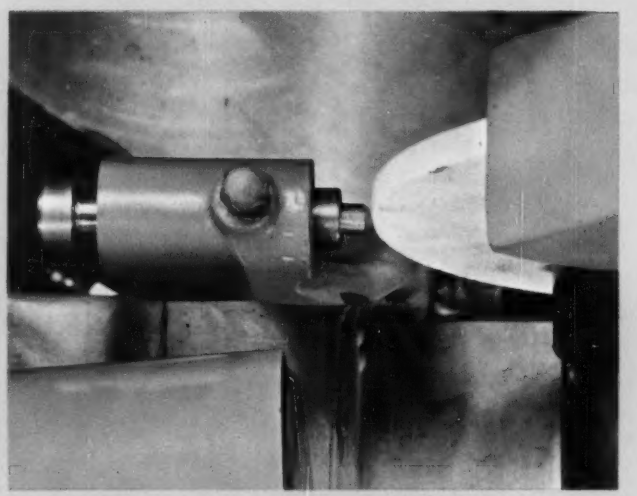
Horizontal Work Spindle
Aids coolant in thoroughly flushing grit from work and chuck . . . assures better surface quality.

The New No. 11 Face Grinding Machine provides a brand-new approach to grinding of flat, concave, or convex work up to 10" diameter and 4¾" thickness. It rotates work on a horizontal axis as opposed to conventional vertical-work-spindle rotary grinders. This feature, combined with fast, lever-controlled chucking and Set-Diamond dressing, makes the No. 11 unsurpassed for high precision and easy operation.

In addition, the No. 11 incorporates many other operating advantages such as: hand or hydraulic wheel slide reversal to .001"; hand or automatic work feeds at each reversal or forward reversal only; presetting of grinding and dressing speeds; work-holding by either permanent magnet chuck or face chuck.

These are only the highlights of this new *and different* face grinding machine. Write for complete information. Also ask for new booklet on our "Pay-As-You-Depreciate" Plan. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

Lever-Control of Work-Holders
Allows speedy chucking through-the-spindle . . . cuts non-productive time.



Set-Diamond Dressing (Viewed from above). Faster, easier . . . eliminates need to re-establish wheel position for accurate sizing after subsequent re-dressings.

B·S

Brown & Sharpe

PRINTED IN U.S.A.

Semi-standard Wales Hydra Springs providing pre-loads of 700 and 2000 and end loads of 4000 pounds per square inch

may be adjusted by changing the pre-load or volume of the cylinder, or the type of Comproil being used. These springs eliminate drilling, spring pads, mechanical adjustments, external dampening, and retainers normally required by mechanical springs.

Circle Item 147 on postcard, page 241

Multiple Drill Head Driven by Flexible Shafts

The Ettco-Emrick Model 600 adjustable-spindle multiple drill head, a lightweight unit designed for drilling or tapping up to six holes simultaneously, has been placed on the market by the Ettco Tool Co., Inc., Brooklyn, N. Y. Use of flexible-shaft drives enables the drill head to be set in a wide range of hole patterns within a small drive-to-spindle distance. The flexible shafts, having been developed specifically for tapping and drilling, will operate at high speeds without vibration or the danger of unraveling because of the repeated reversal of the direction of rotation.

Accurate spindle positioning is accomplished by means of adjusting arms that can be moved even while the spindle is operating. Jig-bored templates can be supplied in place of adjusting arms when a fixed-center set-up is desired. Conversion from drilling to tapping merely requires the addition of a standard tapping faceplate and the replacement of drill collets by interchangeable floating tap collets.

Other design features of the unit include one-piece, hardened and ground, grease-lubricated gears in the driving head; grooved ball thrust bearings for each spindle; and hardened and ground guide rods running in bronze bushings located in an aluminum-alloy head. Capacities of the unit run from 1/32- to 5/16-inch drills in steel, and No. 6 to 5/16-inch taps in aluminum. The maximum size bolt circle is 6 7/8 inches in diameter and the minimum center distance between spindles is 15/16 inch.

Circle Item 148 on postcard, page 241

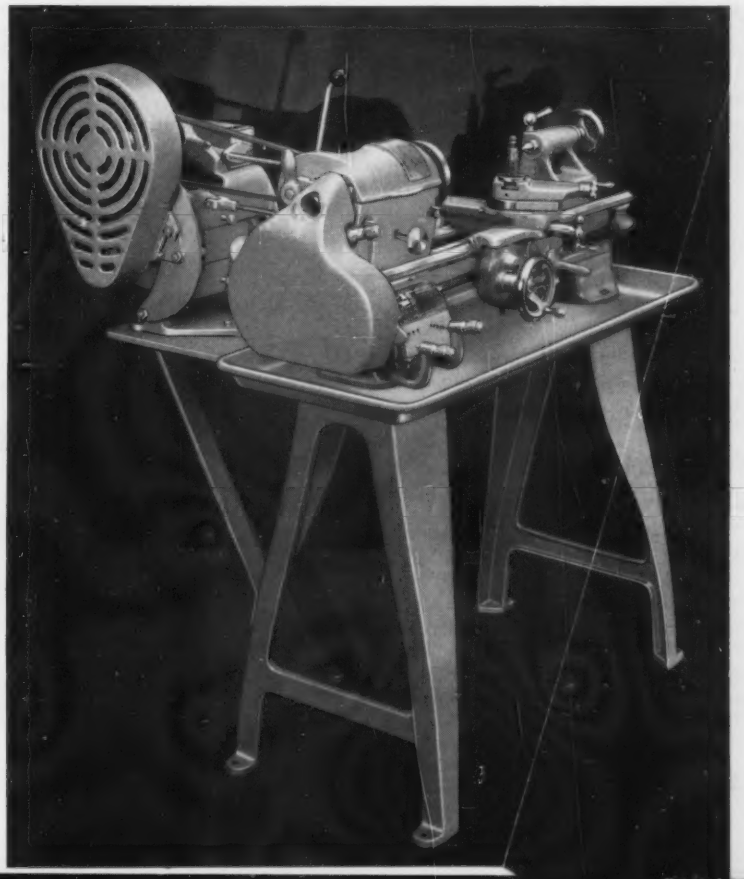
Ettco-Emrick "Flex-Shaft" multiple drill head with tapping faceplate

South Bend Self-Contained Floor Lathes

A line of 9- and 10-inch swing self-contained motor-driven floor lathes has been introduced by the South Bend Lathe Works, South Bend, Ind. Direct belt drive to the spindle assures smooth operation at high spindle speeds. Approximate speeds are 50 to 1270 R.P.M. for the 9-inch lathe, and 48 to 1435 R.P.M. for the 10-inch lathe. The slower speeds obtainable on these machines are transmitted through back-gears.

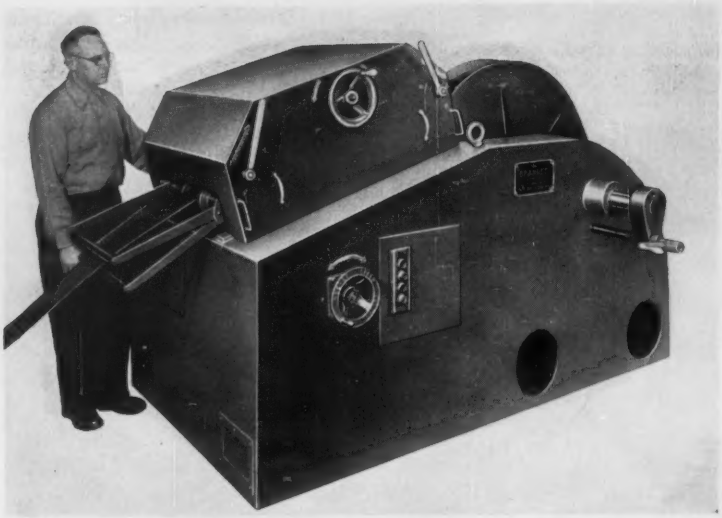
Four bed lengths are available, providing distances between centers from 16 to 34 inches. The 9-inch lathe swings 9 1/4-inch diameter work over the bed and 5 1/2-inch diameter work over the cross-slide. Maximum swing for the 10-inch lathe is 10 inches over the bed and 6 1/4 inches over the cross-slide. Both are furnished with either quick or standard change-gear boxes.

Circle Item 149 on postcard, page 241



South Bend twelve-speed self-contained motor-driven floor lathe built in two sizes

Swiss automatic gaging machine



Brandes combination coil cradle and straightening machine

Automatic Ball and Roller Gaging Machine

A Swiss machine which is said to automatically gage and classify rollers and balls for bearings in diameter groups with increments of 0.00002 inch and a maximum possible error of 0.000004 inch, is being introduced in this country by Carl Hirschmann Co., Inc., Manhasset, N.Y. Cylindrical pieces such as needles can also be fed into the hopper of this machine.

Over-size and under-size pieces are kicked out separately. All other pieces within the required tolerance are classified in as many as seven matched groups. The machine will gage needles from 5/64 to 1/8 inch in diameter and from 5/16 to 61/64 inch long. It will handle rollers from 1/8 to 19/32 inch in diameter and from 13/64 to 7/8 inch long, and balls from 5/64 to 25/64 inch in diameter. The output can be varied from 4000 to 7000 pieces per hour. The machine is 22 by 35 by 63 inches and weighs 400 pounds.

Circle Item 150 on postcard, page 241

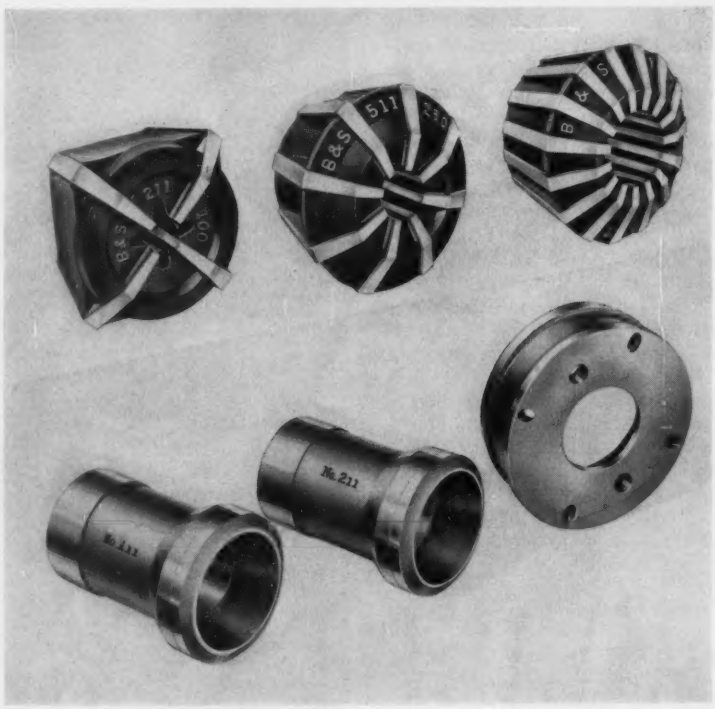
Rubber-Flex Collets for Screw Machines

Collets consisting of a series of radially spaced steel inserts embedded in rubber are now available from the Brown & Sharpe Mfg. Co., Providence, R. I., for its Nos. O and OG automatic screw machines and No. O hand screw machine. Since each collet has a nominal range of 0.050 inch, a set of thirteen collets covers spindle capacity for all round stock from 0.10 to 0.75 inch in diameter. A chuck nut and one of two sizes of chuck sleeves are used with the collets. These "Rubber-Flex" collets are made for Brown & Sharpe by the Jacobs Mfg. Co. Excellent gripping power and concentricity are claimed for the holding devices.

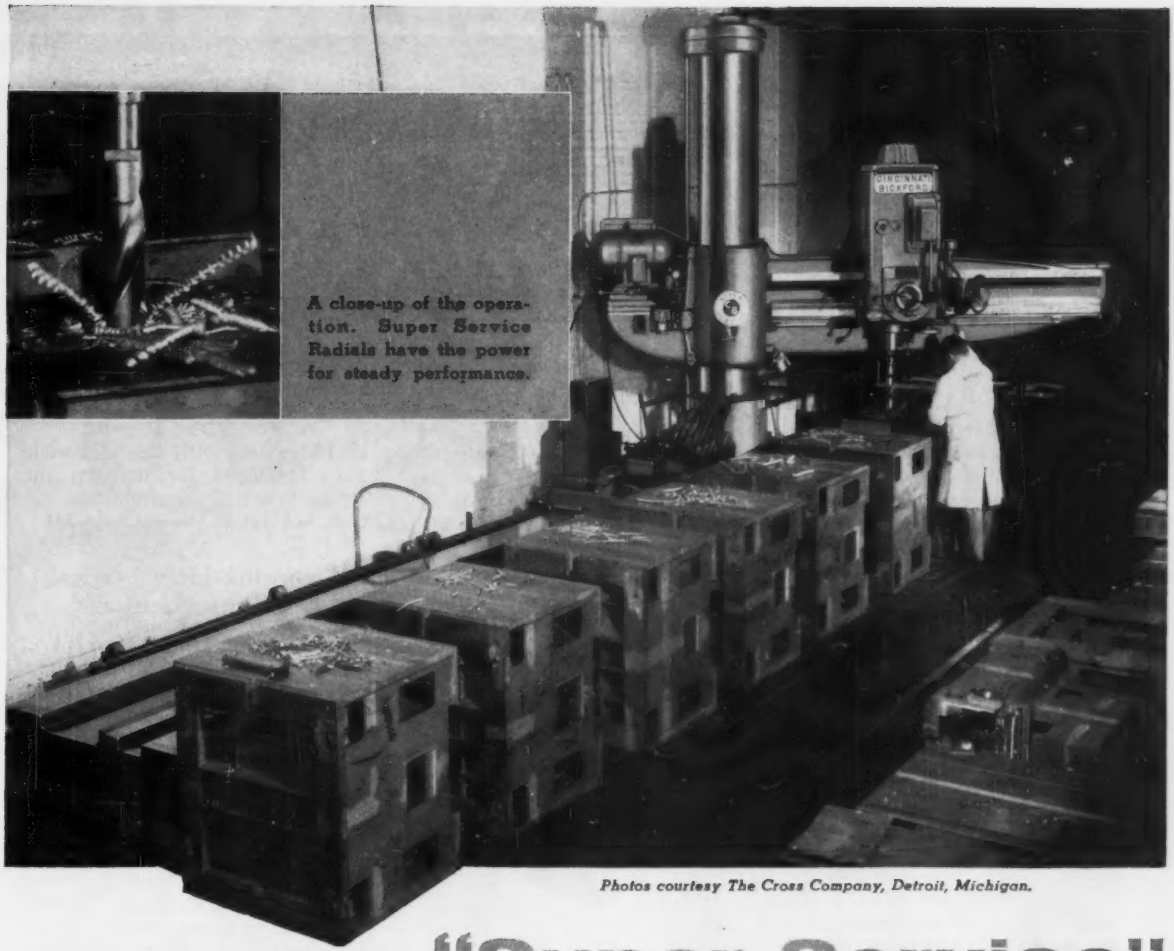
Circle Item 151 on postcard, page 241

Brandes Coil Cradle and Straightener

The Brandes Press Co., Cleveland, Ohio, has introduced a line of combination coil cradle and straightening machines. Models are available to handle coil weights from 2000 to 10,000 pounds, with widths from 8 to 24 inches. The cradle is of conveyor type construction, with guide



"Rubber-Flex" collets for B & S automatic screw machines



A close-up of the operation. Super Service Radials have the power for steady performance.

Photos courtesy The Cross Company, Detroit, Michigan.

a traveling "Super Service" does this LARGE AREA JOB . . .

Here at The Cross Company ten Cincinnati Bickford Super Service Radial Drills are at work . . . On this job, the traveling Radial with sliding base, saves time and gives high production with necessary accuracy. In each of the 7 bases handled here there are 20 holes drilled and tapped and one 3" diameter bored and chamfered. The Cross Company say these drilling machines "bring easy handling, dependability and durability."

Write for Catalog R-29.

80 YEARS OF SERVICE

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

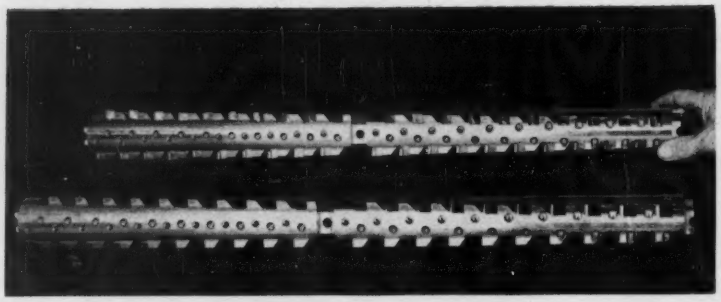
Cincinnati 9, Ohio, U.S.A.

plates which rotate the coil to prevent crimping or damaging the edge of the material. The straightening, or leveling, unit is equipped with either five or seven power-driven rolls and one or two sets of pinch rolls. A 4 to 1 variable-speed drive powers the machine to feed at from 30 to 120 feet per minute.
Circle item 152 on postcard, page 241

Carbide Inserted-Tooth Surface Broach

Red Ring inserted-tooth carbide surface broaches, designed to avoid chatter and cut tool costs when taking heavy cuts on semicircular cast-iron surfaces, are now available from the National Broach & Machine Co., Detroit, Mich. These broaches feature a broach bar having machined integral lugs that back up each of the inserted cutters.

The round steel broach-bar sections have square holes along their length, located on radial center lines that follow a helical path down the bar. A typical design, shown in the illustration, has two rows of inserted carbide cutters. One row broaches half of a semicircular bearing cap surface, and the second row broaches the remaining half. Thus each tool cuts to a full depth and takes a relatively heavy cut to generate the desired form. A broach of this type is well suited for the finishing of cast iron since it minimizes tool abrasion caused by surface scale.
Circle item 153 on postcard, page 241



Red Ring inserted-tooth broach for finishing semicircular cast-iron surfaces, product of the National Broach & Machine Co.

Versatile metal-working machine

Pullmax Sheet and Plate Working Machine

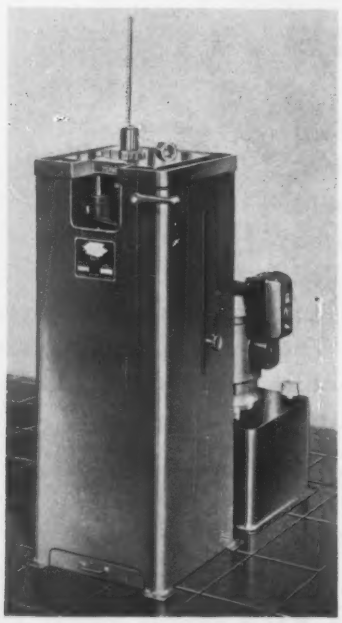
A line of sheet and plate working machines, developed by the American Pullmax Co., Inc., Chicago, Ill., perform a variety of operations such as straight shearing, circle cutting, slot cutting, louver cutting, beading, joggling, and dishing. There are nine sizes in the line. The machines feature quick-locking and fast-adjusting centers and guides.
Circle item 154 on postcard, page 241

Pioneer Vertical Pull-Broaching Machine

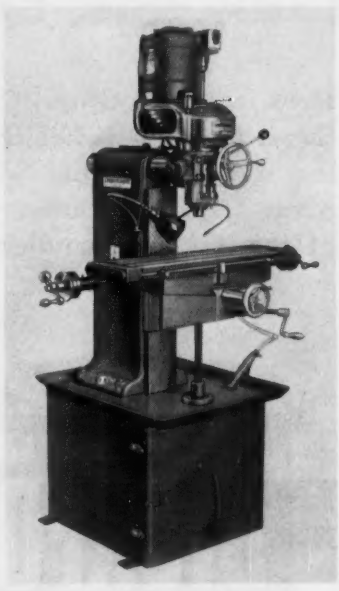
A low-cost, vertical pull-broaching machine is being manufactured by the Pioneer Broach Co., Los Angeles, Calif., for cutting keyways, splines, and regular or irregular shaped holes. It can also be used for surface broaching operations. A force up to 2 tons can be exerted. Full cutting stroke is 15 inches, with an adjustable stop furnished for limiting the stroke to actual requirements.
Circle item 155 on postcard, page 241

Crowningshield Vertical Milling Machine

The Crowningshield-Harris Co., Greenfield, Mass., recently brought out its Model VM-1 vertical milling machine. The equipment is available with a Bridgeport head for tool-room use or with a Crowningshield head for production milling, or without any head if a suitable one is already on hand. The machine has heavy-walled castings, hand-scraped bearing surfaces, and tapered gibs. The working surface of the table measures 8 1/8 by 28 inches. Over-arm diameter is 3 inches.
Circle item 156 on postcard, page 241



Pioneer pull-broaching machine

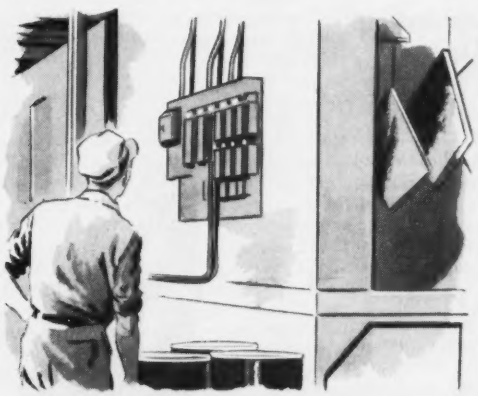


Crowningshield Model VM-1 miller

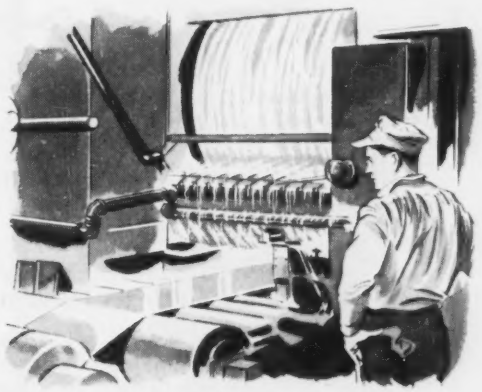
New S.E.C.O. is Tops For These Operations

CUTTING WITH NEW S.E.C.O. Tools stay cool—require less frequent grinding. Finishes are uniformly good.

GRINDING WITH NEW S.E.C.O. Surface finishes are good. Loading and glazing of wheel are reduced—wheel life is prolonged.



WASHING WITH NEW S.E.C.O. Thorough removal of grease and dirt provides clean surfaces for smooth, long-lasting finishes.



ROLLING WITH NEW S.E.C.O. Rolls stay clean. You get maximum reductions and low power consumption.

New Sunoco Emulsifying Cutting Oil increases production, cuts operating costs. Its high machining efficiency permits uniformly good finishes, prolongs tool life. Its high detergency and purity keep tools, parts and machines clean. Its excellent mixing qualities permit its use in cold, hard or hot water. Test New S.E.C.O. in your own plant. For more information, call your nearest Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. M-2.

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

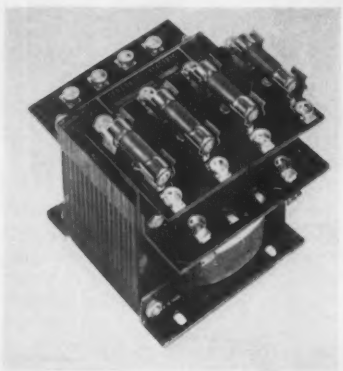
SUNOCO®

PHILADELPHIA 3, PA. • SUN OIL COMPANY LTD., TORONTO & MONTREAL

Refiners of famous High-Test Blue Sunoco Gasoline

G.E. Transformer for Machine Tools

Machine tool transformers available in 100 combinations of ratings and accessories have been announced by the Specialty Transformer Department of the General Electric Co., Schenectady, N. Y. The transformers save panel space and reduce wiring costs by incorporating accessory connections, formerly mounted separately, directly in the basic unit. The line includes eight ratings of 50, 75, 150, 300, 500, 750, 1000, and 1500 volt-amperes. Links are provided

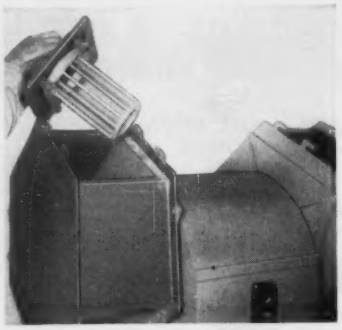


for easy change-over from series to parallel connections, eliminating the need for panel manufacturers to supply additional jumpers.

Circle Item 157 on postcard, page 241

Tumbling Drum with Three Covers

A drum featuring three removable covers permits selective tumbling in the Super-Twin barrel finisher of the Rampe Mfg. Co., Cleveland,

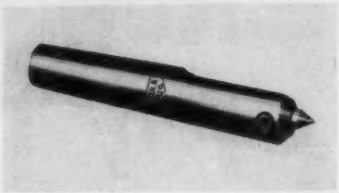


Ohio. Special racking fixtures can be applied to each of the covers, dispensing with the need for specially built barrels. Extra covers permit a wide variety of parts to be tumbled in the same barrel.

Circle Item 158 on postcard, page 241

Centers Have Replaceable Carbide Tips

A "Grip-Tip" center, consisting of a holder and a replaceable carbide tip, has been announced by the Detroit Reamer & Tool Co., Detroit, Mich. The tool-steel holder is available in several Brown & Sharpe,

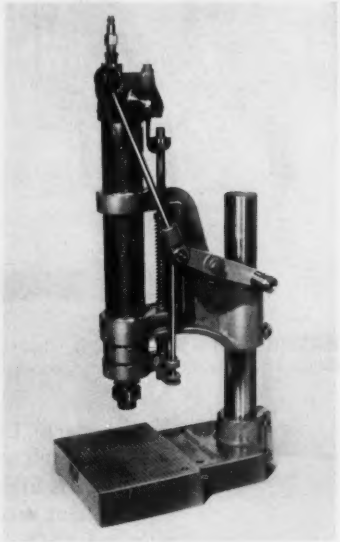


Morse, and Jarno shank tapers. Solid carbide tips may be had in 1/4- and 1/2-inch diameters and are accurate to 0.0005 inch. Special shank tapers and tip diameters can be furnished to customer specifications. An adjustable screw in the holder positions the carbide tips.

Circle Item 160 on postcard, page 241

Heidrich-Nourse Impact Machine

Model 2-CSB, air-operated impact machine, developed by the Heidrich-Nourse Co., Los Angeles, Calif. This is a smaller and simplified version of the Model 3-VS machine described in November, 1953, MACHINERY, page 239. It is essentially a single-stroke air hammer with the hammer moving within a closed cylinder and transmitting its impact force through a



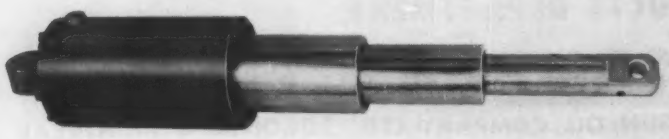
tool-holding chuck. The length of the hammer stroke is constant, and the force of impact is adjusted by regulating the volume of incoming air. The impact range is from zero to approximately 7000 pounds. The press is used for impression marking in metal, staking, and shearing of plastics.

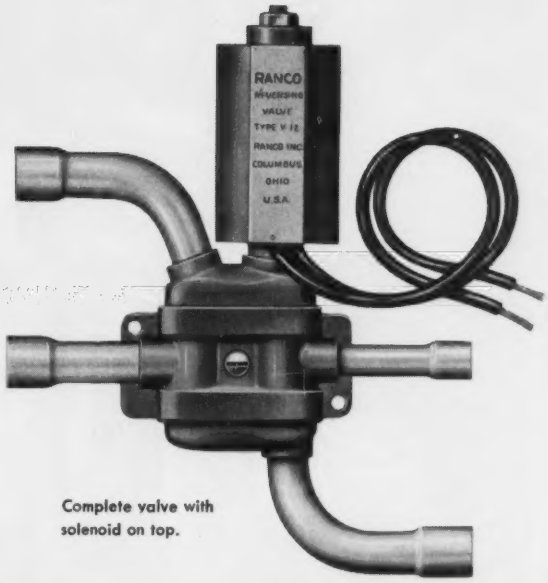
Circle Item 161 on postcard, page 241

Telescoping Hydraulic Cylinder Designed to Position and Hold Heavy Press Members in Place

One of two new special hydraulic cylinders of the telescoping type made by the Greenerd Arbor Press Co., Nashua, N. H. These cylinders were designed to move the main cylinder and ram of a pull-down type hydraulic press to various working positions above the work-table. The cylinders are required to accurately position the press members and hold them securely in place for twelve to fifteen hours, as well as prevent them from dropping over a long period of time. The cylinders are of the single-action type, accurately bored and honed to size, and fitted with O-rings. The lifting capacities of the cylinders or sleeves, when operating under an oil pressure of 1000 pounds per square inch, are as follows: first sleeve, 15,900 pounds with a travel of 6 5/8 inches; second sleeve, 8295 pounds with a travel of 6 3/8 inches; and the third sleeve, 3976 pounds with a 6 1/8-inch travel.

Circle Item 159 on postcard, page 241





Complete valve with solenoid on top.

REVERE

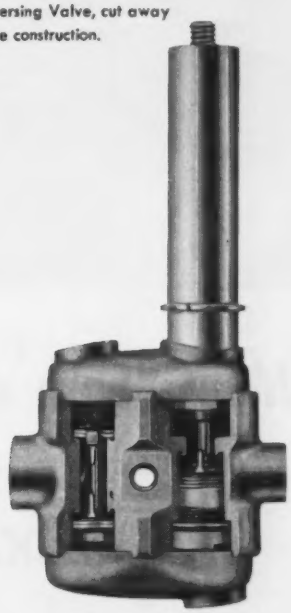
collaboration helped make this reversing valve possible

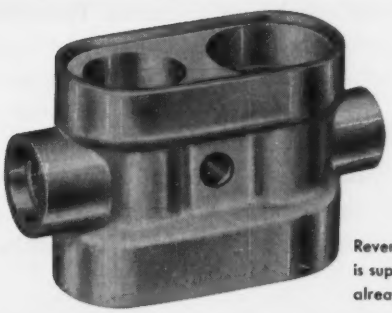
The valve shown here is unique. It is made by Ranco, Incorporated, Columbus, Ohio, and is being supplied to manufacturers of air conditioners that either cool or heat, according to the temperature. When the thermostat calls for cooling, a solenoid moves the valve to the cool position; when heat is required, the operation is reversed, automatically.

Naturally, the development of this valve took a long time. For some five years the Revere Technical Advisory Service has been collaborating closely with Ranco engineers on design and materials for control valves of various types. When the new idea was under development, Revere was called in because non-magnetic brass and copper would be required for the body. Designs were mutually studied, and it was decided to make the main portion of the body from a brass forging, which would lessen machining and provide a dense, non-porous, non-leaking part. Many thousands of these reversing valves have been shipped to makers of ½, ¾ and 1-horsepower units, without a single forging rejection. One important feature of the forging is that it makes possible silver brazing the inlet and outlet tubes so quickly that no damage is done to the synthetic valve washers. Ranco feels that the valve has a tremendous future, offering as it does completely automatic selection of heating or cooling.

When you have a new project on your boards, involving aluminum, brass or copper, we suggest you get in touch with the Revere Technical Advisory Service. Its knowledge added to yours may make your products better. See the nearest Revere Sales Office.

Ranco Reversing Valve, cut away to show the construction.





Revere Brass Forging is supplied to Ranco already machined.

REVERE

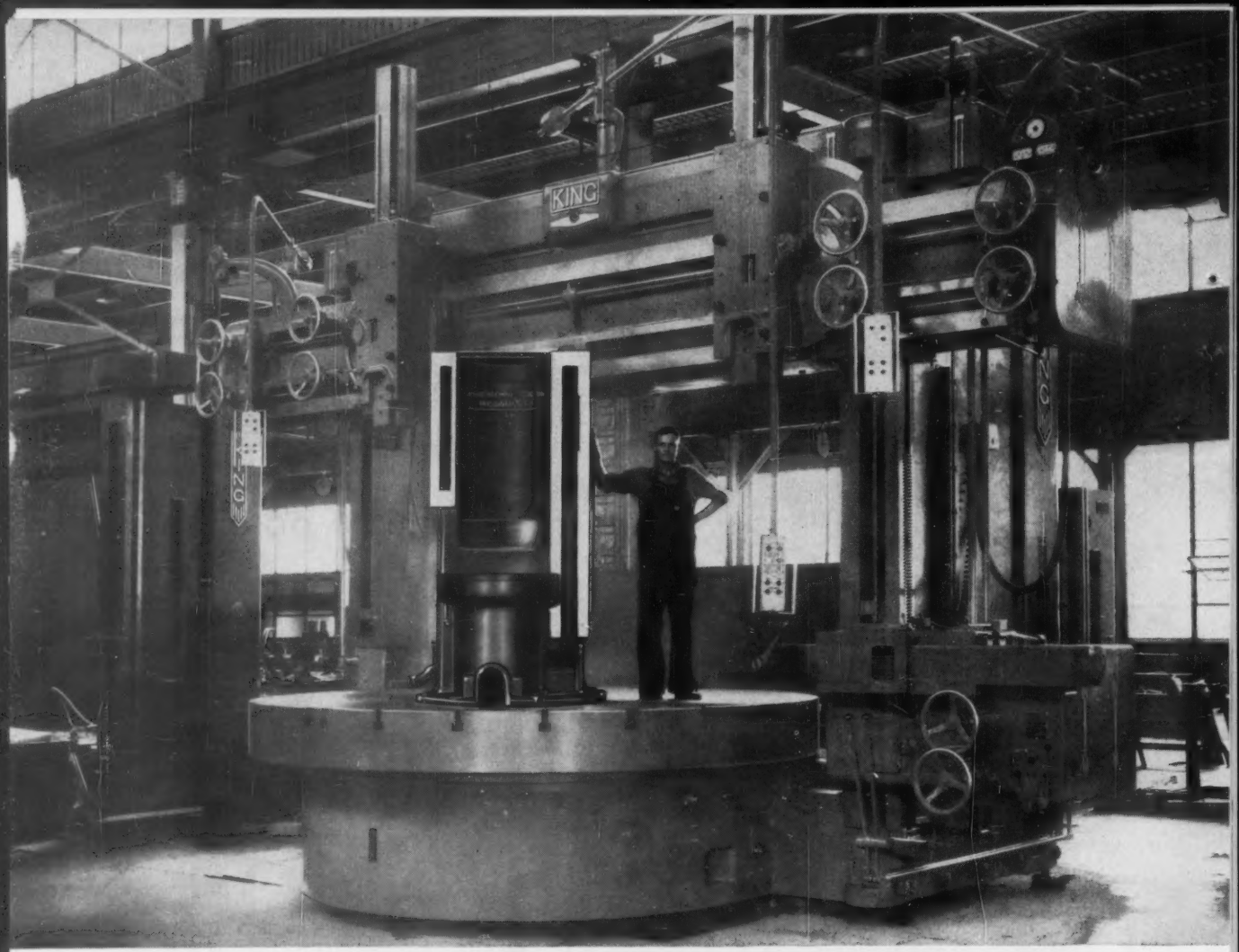
COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere.



Meet "both ends" of the KING size range

30" to 144"

VERTICAL BORING & TURNING MACHINES

Pictured above, on the table of a massive 144" KING® Vertical Boring & Turning Machine, is the base and column of a rugged 30" KING . . . the "big" and "little" of the KING size range. KING and *only* KING "covers the field" with ten sizes: 30" and 36", one head on rail—42", 52", 62", 72", 84", 100", 120" and 144", one or two heads on rail. All size KINGS are available in a variety of head combinations, with or without side head.

KING'S wide size range lets you select the *right* size machine to fit *your* boring, facing, and turning requirements. These extra-heavy, extra-rigid machines have the speed, power, ease of control, and dependable accuracy that are essential for turning out your work with maximum efficiency in minimum time. See your KING distributor—or write us direct—for complete information on the many outstanding features of KING machines.

AMERICAN STEEL FOUNDRIES

KING MACHINE TOOL DIVISION

Vertical boring & turning machines . . . 1150 TENNESSEE AVE., CINCINNATI 29, OHIO

AMERICAN STANDARD BUTTRESS SCREW THREADS—4

Table 2. Tolerances on Buttress Screw Threads*

Class 3 (Close)

Major Diameter	Preferred Diameters	Threads per Inch: 20	16	12	10	8	6	5	4	3	2½	2	1½	1¼	1	Tolerance on Major Diam. of External Thread and Minor Diam. of Internal Thread	Major Diameter
		Tolerance on Pitch (Effective) Diameter, Screw and Nut															
From ½ to 1 1/16	½, 9/16, ⅝, 11/16	0.0037	0.0040	0.0044	....	....	....	....	....	....	....	....	....	....	....	0.0030	From ½ to 1 1/16
Over 1 1/16 to 1	¾, ⅞, 1	....	0.0042	0.0046	0.0049	....	....	....	....	....	....	....	....	....	....	0.0030	Over 1 1/16 to 1
Over 1 to 1 ½	1 ⅛, 1 ¼, 1 ⅜, 1 ½	....	0.0043	0.0048	0.0051	0.0055	0.0061	....	....	....	....	....	....	....	....	0.0040	Over 1 to 1 ½
Over 1 ½ to 2 ½	1 ¾, 2, 2 ¼, 2 ½	....	0.0046	0.0050	0.0053	0.0058	0.0064	0.0068	0.0074	....	....	....	....	....	....	0.0050	Over 1 ½ to 2 ½
Over 2 ½ to 4	2 ¾, 3, 3 ½, 4	....	0.0049	0.0053	0.0056	0.0061	0.0067	0.0071	0.0077	....	....	....	....	....	....	0.0050	Over 2 ½ to 4
Over 4 to 6	4 ½, 5, 5 ½, 6	....	....	0.0056	0.0059	0.0064	0.0070	0.0074	0.0080	0.0089	....	....	....	....	....	0.0060	Over 4 to 6
Over 6 to 10	7, 8, 9, 10	....	....	....	0.0063	0.0067	0.0074	0.0078	0.0084	0.0093	0.0100	0.0108	....	....	....	0.0060	Over 6 to 10
Over 10 to 16	11, 12, 14, 16	....	....	....	0.0068	0.0072	0.0078	0.0083	0.0089	0.0098	0.0104	0.0113	0.0126	0.0135	....	0.0070	Over 10 to 16
Over 16 to 24	18, 20, 22, 24	....	....	....	....	0.0077	0.0083	0.0088	0.0094	0.0103	0.0109	0.0118	0.0130	0.0139	0.0152	0.0080	Over 16 to 24

Table 3. Tolerances on Buttress Screw Threads

Class 2 (Medium)

Major Diameter	Diameter Increment 0.002 $\sqrt{D}$	Preferred Diameters	Threads per Inch: 20	16	12	10	8	6	5	4	3	2½	2	1½	1¼	1	Tolerance on Major Diam. of External Thread and Minor Diam. of Internal Thread	Major Diameter
			Tolerance on Pitch (Effective) Diameter, Screw and Nut															
From ½ to 1 1/16	0.00168	½, 9/16, ⅝, 11/16	0.0056	0.0060	0.0067	....	....	....	....	....	....	....	....	....	....	....	0.0040	From ½ to 1 1/16
Over 1 1/16 to 1	0.00189	¾, ⅞, 1	....	0.0062	0.0069	0.0074	....	....	....	....	....	....	....	....	....	....	0.0040	Over 1 1/16 to 1
Over 1 to 1 ½	0.00215	1 ⅛, 1 ¼, 1 ⅜, 1 ½	....	0.0065	0.0071	0.0076	0.0083	0.0092	....	....	....	....	....	....	....	....	0.0050	Over 1 to 1 ½
Over 1 ½ to 2 ½	0.00252	1 ¾, 2, 2 ¼, 2 ½	....	0.0068	0.0075	0.0080	0.0086	0.0096	0.0103	0.0112	....	....	....	....	....	....	0.0050	Over 1 ½ to 2 ½
Over 2 ½ to 4	0.00296	2 ¾, 3, 3 ½, 4	....	0.0073	0.0080	0.0084	0.0091	0.0100	0.0107	0.0116	....	....	....	....	....	....	0.0050	Over 2 ½ to 4
Over 4 to 6	0.00342	4 ½, 5, 5 ½, 6	....	....	0.0084	0.0089	0.0095	0.0105	0.0112	0.0121	0.0134	....	....	....	....	....	0.0070	Over 4 to 6
Over 6 to 10	0.00400	7, 8, 9, 10	....	....	....	0.0095	0.0101	0.0111	0.0117	0.0127	0.0140	0.0149	0.0162	....	....	....	0.0080	Over 6 to 10
Over 10 to 16	0.00470	11, 12, 14, 16	....	....	....	0.0102	0.0108	0.0118	0.0124	0.0134	0.0147	0.0156	0.0169	0.0188	0.0202	....	0.0090	Over 10 to 16
Over 16 to 24	0.00543	18, 20, 22, 24	....	....	....	....	0.0115	0.0125	0.0132	0.0141	0.0154	0.0164	0.0177	0.0196	0.0209	0.0227	0.0100	Over 16 to 24
Pitch Increment 0.0173 $\sqrt{p}$			0.00387	0.00432	0.00499	0.00547	0.00612	0.00706	0.00774	0.00865	0.00999	0.01094	0.01223	0.01413	0.01547	0.01730		

Table 4. Tolerances on Buttress Screw Threads

Class 1 (Free)

Major Diameter	Preferred Diameters	Threads per Inch: 20	16	12	10	8	6	5	4	3	2½	2	1½	1¼	1	Tolerance on Major Diam. of External Thread and Minor Diam. of Internal Thread	Major Diameter
		Tolerance on Pitch (Effective) Diameter, Screw and Nut															
From ½ to 1 1/16	½, 9/16, ⅝, 11/16	0.0083	0.0090	0.0100	....	....	....	....	....	....	....	....	....	....	....	0.0050	From ½ to 1 1/16
Over 1 1/16 to 1	¾, ⅞, 1	....	0.0093	0.0104	0.0111	....	....	....	....	....	....	....	....	....	....	0.0050	Over 1 1/16 to 1
Over 1 to 1 ½	1 ⅛, 1 ¼, 1 ⅜, 1 ½	....	....	0.0107	0.0114	0.0124	0.0138	....	....	....	....	....	....	....	....	0.0060	Over 1 to 1 ½
Over 1 ½ to 2 ½	1 ¾, 2, 2 ¼, 2 ½	....	....	0.0113	0.0120	0.0130	0.0144	0.0154	0.0168	....	....	....	....	....	....	0.0060	Over 1 ½ to 2 ½
Over 2 ½ to 4	2 ¾, 3, 3 ½, 4	....	....	0.0119	0.0126	0.0136	0.0150	0.0160	0.0174	....	....	....	....	....	....	0.0060	Over 2 ½ to 4
Over 4 to 6	4 ½, 5, 5 ½, 6	....	....	....	0.0133	0.0143	0.0157	0.0167	0.0181	0.0201	....	....	....	....	....	0.0080	Over 4 to 6
Over 6 to 10	7, 8, 9, 10	....	....	....	0.0142	0.0152	0.0166	0.0176	0.0190	0.0210	0.0224	0.0243	....	....	....	0.0100	Over 6 to 10
Over 10 to 16	11, 12, 14, 18	....	....	....	....	0.0162	0.0176	0.0187	0.0200	0.0220	0.0235	0.0254	0.0282	0.0303	....	0.0110	Over 10 to 16
Over 16 to 24	18, 20, 22, 24	....	....	....	....	0.0173	0.0187	0.0197	0.0211	0.0231	0.0246	0.0265	0.0293	0.0314	0.0341	0.0130	Over 16 to 24

All dimensions are given in inches.

*Class 3 pitch diameter tolerances are 2/3 of Class 2 tolerances. Class 1 pitch diameter tolerances are 1 1/2 times Class 2 tolerances. Allowances on major, minor, and pitch diameters for all classes of external buttress screw threads are the same as for Class 3 (close) tolerances.

Extracted from ASA B1.9–1953 with permission of publisher, American Society of Mechanical Engineers

AMERICAN STANDARD BUTTRESS SCREW THREADS—5

Gaging

10. General—Buttress threads are employed for thrust purposes and it is essential to obtain as large a contact area as practical between the pressure flanks of the threads of mating components. Therefore, differences in the angle of the pressure flanks and of lead in the length of engagement of mating components should be kept as small as possible. The trailing flank at 45 degrees will normally clear, and differences in the angles of the trailing flanks of the product are of lesser importance. However, measuring the pitch (effective) diameter of buttress thread gages presents some difficulty because of the wide difference between the angle of the pressure flank and the angle of the trailing flank. The trailing flank at 45 degrees has a greater effect on the pitch diameter measurements than the 7-degree pressure flank, therefore the trailing flank angle on thread gages must be held to a tolerance at least as close as the tolerance on the pressure flanks and "best size" wires should be used.

A product that is a snug fit in or on "GO" thread gages outlined in the following section will interchange. If there is any difference in the thread angles or lead of the product and the mated "GO" gages used, the diametrical clearance space between the threads of the assembled product will be greater than the minimum clearance (allowance) specified in Table 2 for Class 3 (close) tolerances. If excessive clearance (looseness) is objectionable, then the angle of the trailing flank as well as the pressure flank must be held to close limits.

If the quantities required are small and "best size" wires are used to determine the pitch diameter of taps and screws in lieu of thread gages, then the angle of the trailing flank as well as the pressure flank must be held within close limits to secure an interchangeable product.

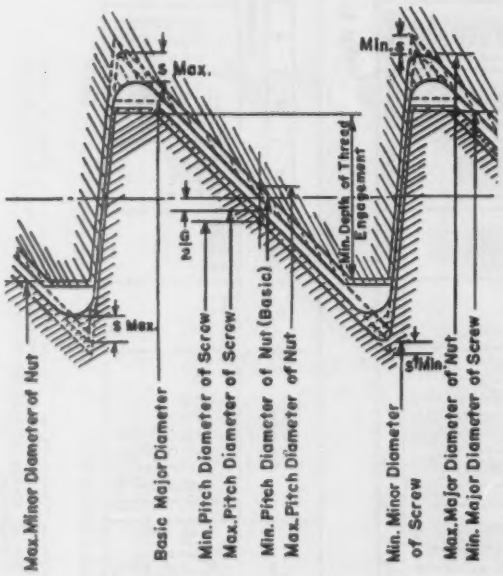


FIG. 2. ILLUSTRATION OF TOLERANCES, ALLOWANCE AND ROOT TRUNCATIONS

11. Recommended Gaging Practice—

(a) For External Threads

1. "GO" and "NOT GO" snap (caliper) or plain ring gages for major diameter;

2. "GO" thread ring gage having pitch (effective) diameter equal to maximum pitch (effective) diameter of external thread, major diameter greater than maximum major diameter of external thread, and minor diameter equal to minimum minor diameter of internal thread;

3. "NOT GO"* thread ring or thread snap (caliper) gage having pitch (effective) diameter equal to minimum pitch (effective) diameter of external thread, major diameter greater than maximum major diameter of external thread, and minor diameter $0.35p$ less than minimum pitch diameter of external thread;

4. Measurement of pitch by an accepted method reading at intervals and over the whole length of engagement;

5. Measurement of the angles of both flanks either by direct optical projection, or by means of suitable templates.

(b) For Internal Threads

1. "GO" thread plug gage having pitch (effective) diameter equal to minimum pitch (effective) diameter of internal thread, major diameter equal to maximum major diameter of external thread, and minor diameter less than minimum minor diameter of internal thread;

2. "NOT GO"† thread plug gage having pitch (effective) diameter equal to maximum pitch (effective) diameter of internal thread, major diameter $0.35p$ greater than maximum pitch diameter of internal thread, and minor diameter less than minimum minor diameter of internal thread;

3. Measurement of pitch as for external threads;

4. Measurement of the angles of both flanks by optical projection from casts of the thread;

5. "GO" and "NOT GO" plain plug gages for minor diameter.

(c) Width of Root Relief

A width of relief at root of $\frac{p}{6}$ is recommended for "GO" plugs and rings, and $\frac{p}{4}$ for "NOT GO" plugs and rings. This relief should be located so that the shoulders formed at intersection of relief and thread flanks will be approximately the same distance from the pitch line.

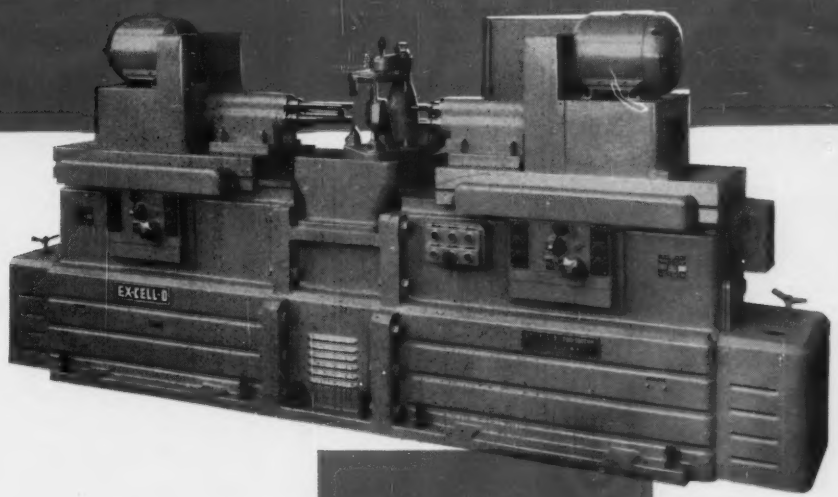
* Instead of "NOT GO" the symbol "LO" is used in ASA Standard B1.2–1951, Screw Thread Gages and Gaging, to designate the minimum metal limit ring gage.

† Instead of "NOT GO" the symbol "HI" is used in ASA Standard B1.2–1951, Screw Thread Gages and Gaging, to designate the minimum metal limit plug gage.

Extracted from ASA B1.9–1953 with permission of publisher, American Society of Mechanical Engineers

Modernize Today for Profits Tomorrow

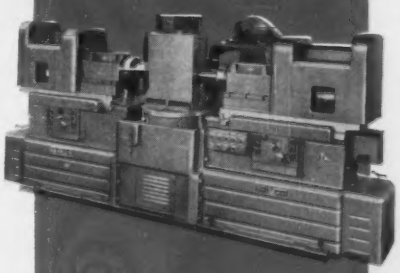
WITH FAST, VERSATILE PRECISION WAY MACHINES



STYLE 58 TWO-WAY: Operates from a single push-button station. Handles large, heavy work. Fixture section can be designed to accommodate the way units from any angle.

Units may be re-arranged around fixture or new fixture sections designed for different operations.

STYLE 54 ONE-WAY: A standard way unit combined with a fixture unit to suit the work. Large, heavy, and awkward parts, loaded in the fixture, remain stationary; the spindles advance to the work.



STYLE 54 THREE-WAY: Standard way units are electrically interlocked to operate simultaneously, or in any sequence. Fast and efficient for machining parts from three directions and holding accurate locations.

STYLE 58 FOUR-WAY: Controlled from a central push-button station. Particularly suitable for machining parts from four directions simultaneously, and performing progressive operations.

54:3

EX-CELL-O

WAY TYPE PRECISION BORING MACHINES ARE PROFIT INSURANCE

Way Machines perform such operations as precision boring, turning and facing. They consist of one or more standard way units combined with a fixture section. Each way unit has its own hydraulic system and controls to operate the spindle slide. Tooling and fixture are added to suit the individual operation. Get details from your Ex-Cell-O representative or write for Way Machine Catalog.

EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS
AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

XLO
EX-CELL-O for PRECISION

Jet-Engine Housings are Rough- and Finish-Machined on Single Automatic Lathe

Maximum utilization of tooling permits a single automatic lathe to be used for rough- and finish-machining cast magnesium alloy jet-engine housings at the plant of a major aircraft engine builder. The Model HD-24 lathe illustrated, built by the Hydra-Feed Machine Tool Corporation, Ferndale, Mich., performs all cutting operations automatically, requiring merely push-button actuation for clamping, starting the feed, and unclamping the work.

A specially designed finger chuck is used to hold the jet-engine housing for machining. Three fingers on the hydraulically operated chuck grip the work-piece firmly without obstructing the movement of the tools or distorting the piece, either when roughing or finishing.

With the exception of a removable chamfering tool that is used only for finishing, tooling is identical for both machining cycles. After the magnesium housing is hydraulically clamped in place to start the roughing cycle, the top and rear carriages rapid-advance to start their cuts. Three tools are used on the top carriage to rough-bore three different diameters. A longitudinally fed tool on the rear carriage simultaneously turns the outside diameter.

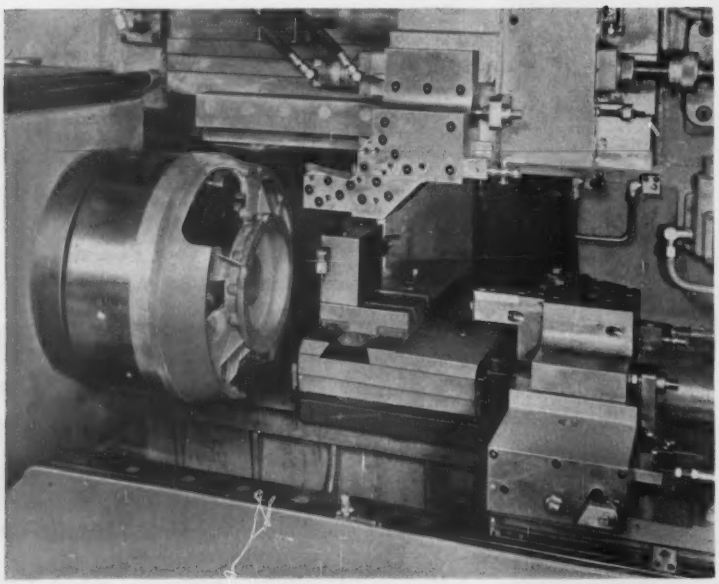
An interesting feature of this set-up is the use of the platen, which is optional on the lathe. As the top and rear carriage rapid-return to clear the work-piece, the platen slide equipped with four tools advances and faces three external surfaces and the bottom of the main bore. At the completion of its cut, the platen automatically retracts and the spindle stops, ready for unloading.

After rough-machining a bank of the magnesium housings, the machine is quickly converted for finish-turning and the chamfering tool is added to the top carriage, this tool being used to break the corner on the largest bore diameter. The lathe is equipped with a two-speed motor which can be run at 1800 or 3600 R.P.M. Provision is made for automatic shifting of motor speeds. By performing both roughing and finishing operations, this single machine is supplying the engine builder's current needs.

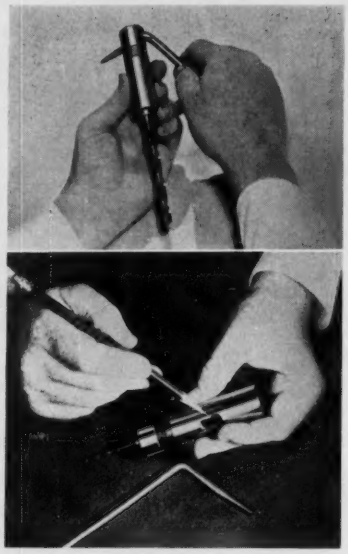
* * *

Film on Band-Sawing

"Production Band Machining" is the name of a new technicolor film produced by the DoAll Co., Des Plaines, Ill. The film stresses rapid machining in the production of duplicate parts. It exploits the principles of removing unwanted material in sections that can be salvaged and of eliminating hold-downs and clamps.



Magnesium alloy jet-engine housing undergoing rough- and finish-machining operations on a single Hydra-Feed lathe



(Top) Using "Keyhole" drift slot tool ejector announced by Scully-Jones & Co.; and (bottom) showing design of drift slot and ejector

"Keyhole" Drift Slot for Tool Ejection on Spindle Type Machine Tools

A "Keyhole" tool ejection method for spindle type machine tools, announced by Scully-Jones & Co., Chicago, Ill., is based on a new style drift slot and a line of tool ejectors. The slot design consists of a round top portion, as shown in the lower view of the illustration, which serves as a bushing for the key, and a rectangular slot to permit the use of conventional drifts should a tool or adapter become jammed in the spindle.

The cam-shaped tip of the ejector rotates against the top of the tang, pushing the tool from the spindle in one easy motion. With little leverage, the operator can exert a strong force behind the tang, as illustrated in the upper view. There are no axial stresses or hammer blows to destroy spindle alignment or damage precision bearings. Specifications are being offered to machine tool designers.

* * *

The average yield of copper ore mined in the United States is less than 1 per cent copper. However, as claimed in the first issue of the *Copper Industry Report*, the current annual per capita consumption of this metal is about 18 pounds.

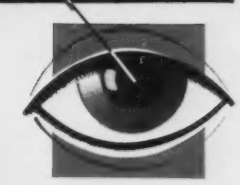
ANOTHER EXAMPLE of
REDUCING COSTS WITH—

Buhr ECONOMATION

Drills, chamfers, spot-faces and individual-lead-screw taps 377 master-brake cylinders an hour gross....

and features electronic mechanism for checking broken drills!

This 7-way dial-type hydraulic-feed Buhr Special has a 48″-diameter 7-position power-operated index table, complete with shot bolt. Two parts are loaded per station in each of its seven fixtures. Automatic clamping of fixtures is performed by a power-wrench with torque control.



Electronic mechanism automatically checks two .028 drills. Following each cycle, drill-checking arms swing sensing probes to and from drills. If either drill is broken, special electronic sensing-circuit stops machine and flashes failure-light.

Buhr
MULTIPLE-SPINDLE
HIGH PRODUCTION MACHINERY

Find out how Buhr Economation can reduce your production costs. Phone, wire or write us. A consultation with one of our top sales executives will be arranged promptly!

BUHR MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

Solidly Engineered • Precision Built • for World's Leading Manufacturers

Between Grinds

By E. S. Salichs

Honoring Herbert Hoover

National Business Publications, Inc., of which MACHINERY is an active member, recently held its annual State of the Nation Dinner at the Statler in Washington, D. C. Before an impressive gathering of foreign ambassadors, political leaders, business executives, and editors, Vice-President Nixon presented former President Hoover with the Silver Quill Award. Membership of NBP includes the publishers of 171 magazines.

Busy Doings

Among the special days, weeks, and months to be observed this year by the Nation, according to a booklet distributed by the United States Chamber of Commerce, are several that struck us forcibly: Take Tea and See Week (January 14 to 22); One-Dish Meals with Cheese (March 1 to 31); Old Stove Roundup (September and October); Expectant Father's Day (June 18, purpose: to honor the expectant fathers of the Nation); and Meet Your Obligation Sunday (April 24, sponsor: National Retail Credit Association). Many other events are listed which will help businessmen tie in their promotion plans with national celebrations.

Oops, Sorry— Are You Sure?

There was a report in *Tide* of a catsup advertisement in which the artist had drawn the top with a left-hand thread. Keen catsup consumers were quick to note what was obviously an error, since it is extremely doubtful whether there is a left-handed bottle of catsup on grocers' shelves.

Chameleon Chamber

Tusque, a new color tone for Hotpoint kitchen appliances, is defined as a pastel fusion of blue-gray with a green overtone. When a stove with this finish, for example, is placed near blue, gray, or green, it will pick up that particular color.

The Major and His Mark

Some time back, a major in the United States Air Force who was taking a course at the USAF Institute of Technology wrote to the Editor requesting some assistance in preparing his term paper on purchasing machine tools. Suggestions were duly made and now a letter of thanks has arrived: "I am happy to announce that I received an 'A' in the course, a grade given all too sparingly at this school."

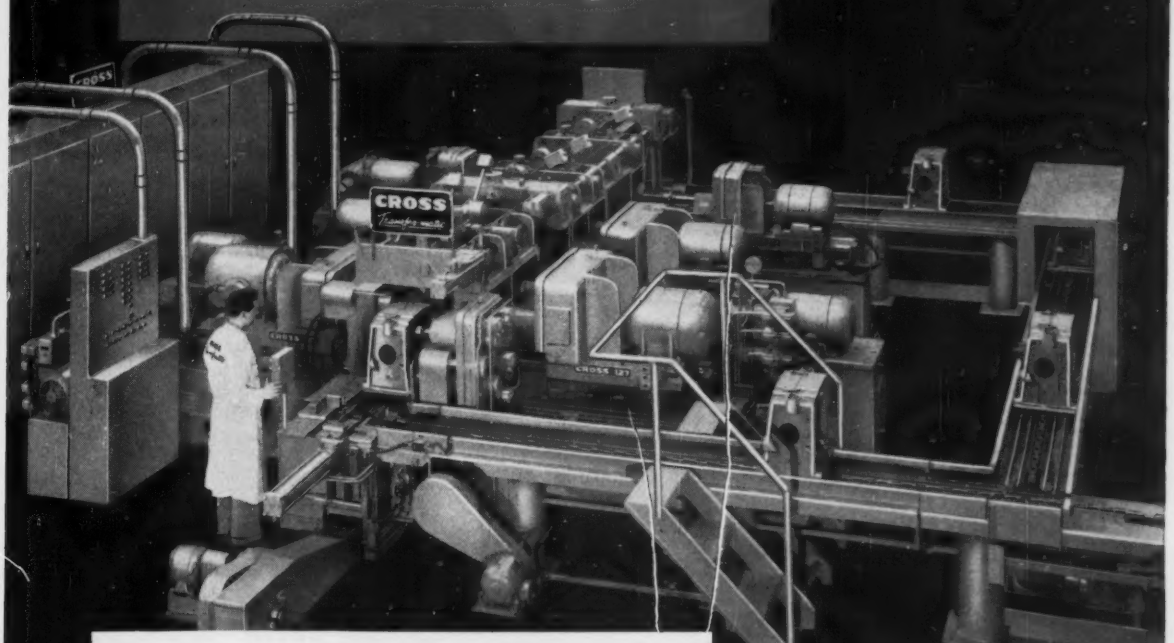
The Mrs. Misses

A woman recently telephoned our office for information. Her husband, she stated, needed a machine on a flat base with a flat arm at the end of which is a motor. What kind of machine is it and where can he buy it, please?

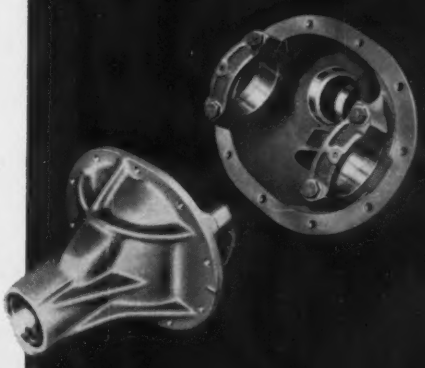
HAVE YOU ORDERED YOUR 1955 MODEL?— A 14-inch television set, a telephone, and a tape recorder are features of this sedan exhibited by the Cadillac Motor Car Division at the GM Motorama held in New York City the end of January. In order not to distract the chauffeur, the TV and other attractions are in the back seat. With such a glamorous passenger tuning in, we hate to mention this but it may be one way of keeping the proverbial mother-in-law quiet—the TV we mean. Another point: Should you be getting any ideas about installing a set in the front panel, there is a law against it in at least one state that we know of!

Another Transfer-matic by Cross

Machines Rear Axle Differential Gear Housings



- ★ Rough and semi-finishes pinion bores; rough bores, semi-finish bores and taps cross bores.
- ★ 155 parts per hour at 100% efficiency.
- ★ 9 stations—1 for loading, 4 for boring, 1 for tapping, 2 for indexing, 1 for visual inspection.
- ★ Pallet-type work holding fixtures.
- ★ Hydraulic power wrench for clamping parts.
- ★ Automatic transfer of fixtures from station to station.
- ★ Other features: Complete interchangeability of all standard and special parts for easy maintenance; construction to J.I.C. standards; hardened and ground ways; tandem drive for locating pins; hydraulic feed and rapid traverse; automatic lubrication; oil-mist lubrication for taps; drag-chain type chip conveyor.



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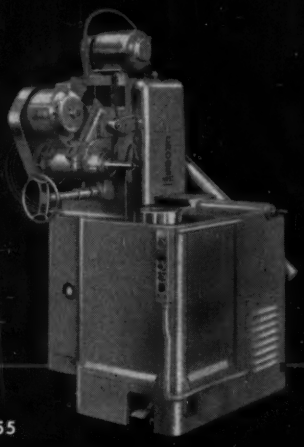
THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

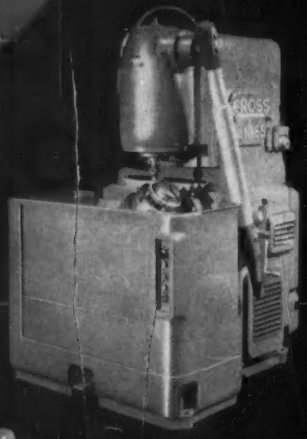
for rounding • chamfering • pointing • burring

Greater Flexibility with Cross Gear Machines



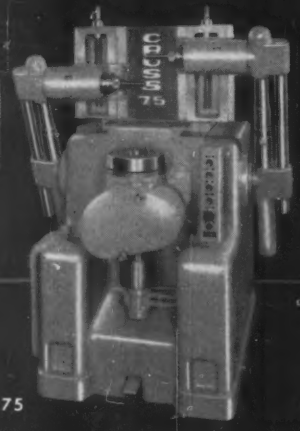
NO. 55

For rounding, pointing, chamfering or burring external and internal—
spur gears • helical gears
clutches • splines
Typical production—rounding or pointing 8 pitch 30 tooth gears—55 net hourly.



NO. 65

For pointing or chamfering external and internal—
clutches • spur gears
bevel gears • splines
Typical production—pointing 10 pitch 30 tooth gears—100 net hourly.



NO. 75

For burring or chamfering both ends at the same time—
helical gears • spiral bevel pinions
hypoid pinions
Typical production—chamfering 8 pitch 40 tooth gears—200 net hourly.

★ Flexibility for handling a wide variety of gears.
★ Rugged, heavy duty construction for continuous high production or job shop operation.
★ Short setup time (as little as 15 minutes) for changing from one gear to another.
★ Simple, inexpensive tooling.
★ Push button controlled automatic cycle.
★ Hydraulic power work clamping.

For mass production or short run jobbing operations, there is a Cross Gear Machine to suit your requirements.

Established 1898

THE CROSS CO.
DETROIT 7, MICHIGAN
Special MACHINE TOOLS

For more information on products advertised, use Inquiry Card, page 241

News OF THE INDUSTRY

California and Washington

U. S. INDUSTRIES, INC., New York City, has acquired the assets of the FRAY MACHINE TOOL CO., Burbank, Calif. The acquired concern, in business since 1931, manufactures milling machines, milling machine heads, and offset boring heads for tool-room and production use. The Fray operation will be moved into the Vernon (Los Angeles) plant of the Axelson Mfg. Co., Division of U. S. Industries, Inc. The Fray milling machine will be sold through the present Axelson lathe sales organization and will be known as the Axelson milling machine.

CLEVELAND CRANE & ENGINEERING CO., Wickliffe, Ohio, has begun construction of a plant on the West Coast, located at 6435 Corvette St., Central Manufacturing District, Los Angeles, Calif. The building will be occupied jointly by the Cleveland Crane & Engineering Co. and its California Cleveland Tramrail distributor—General Conveyor, Inc.

DONALD J. LEWIS has been appointed a sales representative in the Western territory for standard products and contract manufacturing activities of the Taft-Peirce Mfg. Co., Woonsocket, R. I. His business address is 3690 Santa Fe Ave., Los Angeles 58, Calif.

ROTOR TOOL CO., Cleveland, Ohio, announces the appointment of MITCHELL R. OLSEN of the Olsen Co., 5341 Santa Monica Blvd., Los Angeles, Calif., as dealer for southern California. The Olsen Co. will carry a stock of Rotor portable air and high-cycle tools and repair parts.

KENT-OWENS MACHINE CO., Toledo, Ohio, has appointed the MACHINERY SALES CO., 2838 Leonis Blvd., Los Angeles, Calif., agent for its milling machines in southern California, Arizona, and part of Nevada.

H. W. WRIGHT, of the Wright Engineering Co., Pasadena, Calif., has been appointed West Coast representative for the ANDERSEN LABORATORIES, INC., West Hartford, Conn., producers of solid ultrasonic delay lines. Specializing in technical products, Mr. Wright and his company will act as design, technical, and sales representatives.

STARBUCK MACHINE TOOL CO., 4111 Airport Way, Seattle, Wash., has been appointed a representative for Reid surface grinders in Washington by REID BROTHERS CO., INC., Beverly, Mass.

Illinois and Indiana

CHESTER E. AULT has been appointed assistant sales manager for the Link-Belt Co., Chicago, Ill., at the 300 W. Pershing Road plant in Chicago. He succeeds ANDREW K. KOLAR, who has been named purchasing agent for the same plant.

WEAVER E. FALBERG has been appointed general manager of sales for the sixteen nation-wide plants of Joseph T. Ryerson & Son, Inc., Chicago, Ill. Mr. Falberg has been with Ryerson since 1936, and after various assignments became assistant general manager of sales last year. This post will now be filled by JOHN A. HOUSTON, who was formerly assistant sales manager of the Chicago plant. He has been with the company since 1934.

Weaver E. Falberg, who was made general manager of sales for Joseph T. Ryerson & Son, Inc.

LEO W. REULAND has been named manager of the Machine and Small Tool Divisions and the Hendey Machine Division of the Barber-Colman Co., Rockford, Ill. He formerly served as sales manager and production manager, and has been with the firm since 1929. He succeeds ROBERT A. HORNER, who will continue with the company in an advisory capacity.

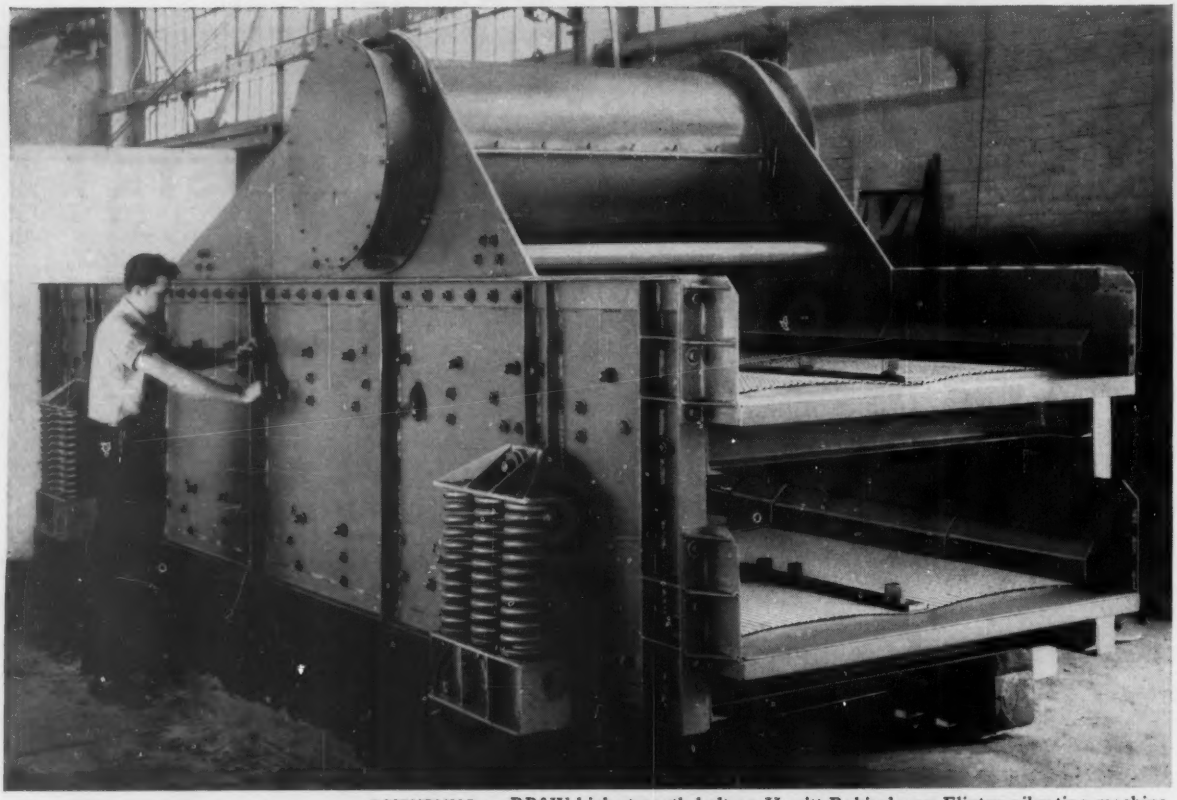
Leo W. Reuland, newly appointed manager of Machine and Small Tool Divisions and Hendey Machine Division of Barber-Colman

RAYMOND A. CLARK, Chicago, Ill., district manager of the Jacobs Mfg. Co., West Hartford, Conn., has retired after thirty years of service. Mr. Clark was particularly well-known among manufacturers of portable electric and pneumatic tools, and light power-driven machinery in which Jacobs chucks were used.

ALEX J. VOGL has been named vice-president of sales, a post newly created by the Wilton Tool Mfg. Co., Inc., Chicago, Ill. He was formerly sales manager, this vacancy now being filled by WILLIAM J. FERRICK, who was assistant sales manager.

BERTRAND J. HANSSON has been appointed a sales representative for the Billings & Spencer Co., Hartford, Conn. His headquarters will be in the company's Chicago, Ill., branch office, 100 S. Jefferson St.

(*Continued on page* 246)



ASSEMBLING an RB&W high-strength bolt on Hewitt-Robins' new Eliptex vibrating machine

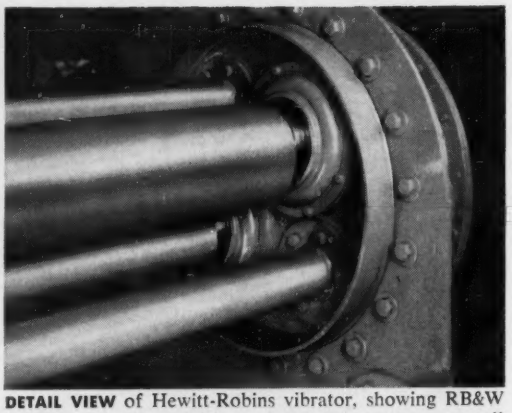
Standardizing on high-strength bolts saves Hewitt-Robins 25%—improves product!

Take a hard look at your fastening operations and you may find you will save a lot by using standard high-strength bolts instead of expensive specials.

Using a standard RB&W high-strength bolt plus a heavy semi-finished nut with two hardened washers, Hewitt-Robins is getting these advantages and savings on vibrating machines: 1. Saving 25% in yearly fastener cost. 2. Eliminating situations requiring body-bound connections with attendant reaming operations. 3. Eliminating all special, finished bolts with varied thread lengths and also all special lock nuts. 4. Eliminating procurement problems and slow delivery of specials. 5. Reducing nut and bolt inventory. 6. Obtaining better performance and lower maintenance on units.

The RB&W product has 2½ to 3 times the clamping force of the previous fasteners. Thus the assembled connection is better able to withstand severe vibration.

Maybe your operation doesn't give fasteners as hard a time as vibrating equipment, but it pays to look into the savings you can expect from specifying standards instead of specials. RB&W has the answers to your questions.



DETAIL VIEW of Hewitt-Robins vibrator, showing RB&W high-strength bolts which must resist shear stress as well as vibration. 4.8

See our insert on high-strength bolts in Sweet's Architectural and Industrial Construction Files.

RB&W **RUSSELL, BURDSALL & WARD**

109 YEARS MAKING STRONG THE THINGS THAT MAKE AMERICA STRONG

Plants at: PORT CHESTER, N.Y.; CORAOPOLIS, PA.; ROCK FALLS, ILL.; LOS ANGELES, CALIF. *Additional sales offices at:* ARDMORE (PHILA.), PA.; PITTSBURGH; DETROIT; CHICAGO; DALLAS; SAN FRANCISCO. *Sales agents at:* NEW ORLEANS, DENVER, SEATTLE. *Distributors from coast to coast.*

For more information on products advertised, use Inquiry Card, page 241

PRODUCT INFORMATION SERVICE

Use postage-free Business Reply Cards for further information
On New Catalogues described in this issue of MACHINERY
On products mentioned in the editorial pages
On products shown in the advertisements

NEW CATALOGUES

DECIMAL EQUIVALENT CHART—Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill. Wall chart showing decimal equivalents and tap drill sizes for wire gage, letter, and fractional size drills. This chart can be obtained on business letterhead request direct to the above address.

CUTTING TOOLS—Putnam Tool Co., 2981 Charlevoix Ave., Detroit 7, Mich. Catalogue 55, containing 112 pages of price and specification information on Putnam end-mills, reamers, counterbores, and holders. Can be obtained on company letterhead request direct to the above address.

METAL FINISHING—The Carborundum Company, Niagara Falls, N. Y. 42-page booklet No. 14, entitled "Specifications and Recommendations to Help You Identify, Select, and Use Abrasive Grain and Powders for Metal Finishing Operations." The booklet contains latest abrasive engineering recommendations of the company and includes such topics as properties of abrasive grain and powders, elements of metal polishing, preparation and care of polishing wheels, and general rules for good polishing. Included is a suggested lay-out for set-up room and curing room. **1**

STEEL-CUTTING CARBIDES—Carboloy Department of General Electric Co., Detroit, Mich. Booklet GT-305, giving latest prices and specifications on Grades 350 and 370 standard tools and blanks in the 300 series steel-cutting carbides. Grade 350 is for medium duty, light roughing, and general finishing; Grade 370 is for heavy-duty cutting applications. Several new tools and blanks recently added to the line are listed, such as throw-away inserts, right- and left-hand offset threading tools, and mechanically held blanks. **2**

COPPER AND COPPER-ALLOY SPECIFICATIONS—American Brass Co., Waterbury, Conn. Anaconda Publication B-34R, a 24-page reference manual containing the latest copper and copper-alloy specifications. In two sections, the first lists the most generally used alloys made by the company, together with the applicable specifications of the engineering societies and government agencies (ASTM, ASME, AWS, SAE, AMS, Federal, Military, Army, Navy, and Joint Army-Navy); the second section lists specifications in numeric order with a brief description of the material. **3**

MILLING CUTTERS—National Twist Drill & Tool Co., Rochester, Mich. This 56-page booklet, entitled "How to Use and Care for Milling Cutters," has been compiled by the Milling Cutter Division of the Metal Cutting Tool Institute. It presents, in pictures and non-technical language, the various factors that contribute to good milling practice. It also suggests means and methods of setting up, operating, and maintaining milling cutters so as to obtain the best possible results. A brief section on safety is included. **4**

PROTECTIVE ATMOSPHERES IN HEAT-TREATING—General Electric Co., Schenectady, N. Y. Bulletin GEA-5907, explaining in 12 pages the four basic types of gas-producing equipment which meet most protective atmosphere needs. Case histories illustrate the savings to be made in different types of jobs. A protective-atmosphere selection guide is given, as well as a table showing approximate compositions and costs of producing typical protective-atmosphere gases. . **5**

DIRECT-CURRENT MOTORS—Aircraft Controls Division, Barber-Colman Co., Rockford, Ill. Catalogue F 4344-1, featuring permanent-magnet direct-current motors with outputs up to 1/10 H.P. A few typical uses of these subfractional horsepower motors are for fan and blower drives, rapid transfer switches, electro-mechanical actuators, generators, gear-head motors, and programming devices. Data sheets describe typical motors from 6 to 115 volts direct-current. **6**

FABRICATING STAINLESS TUBING AND PIPING—Carpenter Steel Co., Alloy Tube Division, Union, N. J. 36-page catalogue telling how to fabricate and work stainless tubing and pipe. Each of eleven types of fabrication is described separately, with illustrative drawings and photographs. Helpful hints are given on how to design for economical fabrication. Tables provide data for cold-bending and coiling both tubing and pipe. **7**

HYDRAULIC MULTIPLE PRESS—Denison Engineering Co., Columbus, Ohio. Catalogue 120-C, showing in 24 pages how many manufacturing problems can be solved through use of the Denison Hydraulic Multipress. Photographs illustrate this press in action on the production line, with detailed descriptions of the various operations possible. Also described are hydraulic pumps, controls, fluid motors, and valves. **8**

MILLING MACHINES—Cincinnati Milling Machine Co., Cincinnati, Ohio. Publication N-1871, featuring HyPowermatic milling machines of heavy-duty fixed bed types, designed for continuous operation on medium- to large-size parts. Consisting of 27 pages, the booklet provides specifications, dimensional drawings, and illustrations of the construction features. Standard and extra cost equipment are listed separately. **9**

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STRETCH-WRAP FORMING MACHINES—Hufford Machine Works Inc., El Segundo, Calif. 84-page booklet entitled "Hufford Stretch-Wrap Forming Machines at Work," showing installations of these machines in practically every aircraft plant within the free world and the many jobs they are performing. Several pages of forming techniques and typical tooling used in these plants are also included. 10

HIGH-SPEED BLANKING PRESSES—Waterbury Farrel Foundry & Machine Co., Waterbury, Conn. Circular 915-N-2, presenting detailed information on Waterbury Farrel blanking presses having a range of 300 to 900 R.P.M. These presses are intended for the mass production of parts requiring blanking, piercing, shallow drawing, and forming from a coil of metal. 11

SILICONE PRODUCTS—Dow Corning Corporation, Midland, Mich. 1955 Reference Guide, briefly describing and indexing the most widely used Dow Corning silicone products. Included are some twenty-three new products, such as silicone adhesives serviceable from minus 65 to 500 degrees F., and silicone molding compounds for producing parts with heat distortion points above 930 degrees F. 12

MILLING CUTTER ARBORS—Lovejoy Tool Co., Inc., Springfield, Vt. Folder containing detailed information on the company's line of milling cutter arbors—standard shell end-mill arbors with National Standard, Morse taper, and Brown & Sharpe taper shanks; centering plugs; heavy-duty flanged arbors; end-mill holders; National Standard arbors; adapter plates; quick-change arbors; and reducing sleeves. 13

BARREL FINISHING—Minnesota Mining & Mfg. Co., St. Paul, Minn. Booklet explaining how barrel finishing works, what types of parts can be handled, and what operations can be performed. An additional booklet, entitled "Abrasive Chips and Compounds for Barrel Finishing," gives specifications for the eleven "Honite" compounds available for cutting, finishing, and cleansing operations. 14

COMBUSTION GAS TURBINES—General Electric Co., Schenectady, N. Y. Bulletin GEA-5516B, containing 27 pages of illustrated information on G-E combustion gas turbines for power generation and mechanical drive. There are three basic models offering a variety of designs to fit the cycle requirements of the electric utility industry and industrial processes. 15

RECESSING TOOL GAGE AND FORM TOOL FIXTURE—Scully-Jones & Co., Chicago, Ill. Folder describing the new compression fixture and setting gage for recessing tools developed by the company. Also featured is a micrometer grinding fixture for circular form tools used in automatic screw machines and recessing tools. Specifications and prices are listed. 16

PRECISION LATHES—Louis Levin & Son, Inc., Los Angeles, Calif. Catalogue "M," containing 34 pages of descriptive information on the company's precision lathes designed for the economical manufacture of small parts. Also described are micro-drill presses for small-hole drilling, micro-drills, and watchmakers' tools. 17

HYDRAULIC PRESSES—Hydraulic Press Mfg. Co., Mount Gilead, Ohio. Bulletin 5408, giving specifications of the 150-ton CU-3 type Fastraverse press for deep-drawing sheet metal. On-the-job photographs show the press handling a variety of metal-working operations including drawing, trimming, coining, flanging, sizing, and tapering. 18

PLASTIC COATING FOR ETCHED CIRCUITS AND NAMEPLATES—Eastman Kodak Co., Rochester, N. Y. Leaflet describing the use of Kodak "Photo Resist" in the production of etched circuits and nameplates. This coating features high stability. Photo Resist can be coated on copper, zinc, aluminum, magnesium, silver, steel, nickel, and brass. Step-by-step methods are outlined. 19

ALUMINUM FASTENERS—Aluminum Company of America, Pittsburgh, Pa. Booklet illustrating and describing Alcoa aluminum fasteners and screw machine products. Included are bolts, screws, binding posts, rivets, washers, knobs, and nails. Special products made to customer specifications on the company's screw machines, headers, and secondary equipment are also illustrated. 20

METAL-CLEANING—Metalwash Machinery Corporation, Elizabeth, N. J. Booklet entitled "What You Should Know About Metal Cleaning," covering types of cleaners, washing cycle, cleaning prior to plating and painting, pickling prior to enameling and between drawing operations, and the application of metal parts processing machinery to the metal-working industry. 21

UNIVERSAL GEAR HOBBING MACHINE—Michigan Tool Co., Detroit, Mich. Bulletin LH-54, showing the adaptability of the company's Model 1445 "Ultra-Speed" gear hobber to automation, and pointing out its universal features. Case histories are given to show the high-speed production potential of this machine. 22

AIR AND HYDRAULIC CYLINDERS—Modernair Corporation, San Leandro, Calif. Manual consisting of 120 pages of factual information on the company's complete line of air and hydraulic cylinders, valves, and packaged fluid power devices. It contains operating data, dimensions, and optional mountings for designers and users of fluid power devices. 23

WELDING VARIABLES IN HARD-FACING—Lincoln Electric Co., Cleveland, Ohio. Reprint entitled "The Effect of Welding Variables on Hard-Facing Deposits," offering practical information on the control of variables in an effort to help the man in the field obtain the best possible hard-facing deposits economically. 24

BLAST CLEANING—Pangborn Corporation, Hagerstown, Md. Bulletin 227, describing the RG Rotoblast which uses the principle of controlled centrifugal force for its blasting power. Line drawings and cut-away views illustrating construction, operation, and maintenance are given. The new Rotoblast wheel is featured. 25

Product Information Service

Use postage-free Business Reply Card below for further information concerning New Catalogues described in this issue and products mentioned in the editorial pages or advertisements.

PLEASE SEND US MORE INFORMATION. Circle below item numbers on which you wish further information.

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157	158	159	160	161	162	163	164	165	166	167	168	169	170

For more details on products mentioned in February editorial or advertising pages, fill in below:

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COMPANY .....

CO. ADDRESS .....

CITY ..... ZONE ..... STATE .....

This card is void after May 1, 1955 M-2/55

EPOXY RESINS AND HARDENERS—Bakelite Co., a Division of Union Carbide and Carbon Corporation, New York City. 16-page booklet devoted to C-8 epoxy resins and hardeners for laminates, adhesives, tools and dies, and castings. Data are given on storage life and handling of these epoxy resins, and there is a section on compounding. **26**

COST SYSTEM FOR HEAT-TREATING OPERATIONS—Metal Treating Institute, New Rochelle, N. Y. 16-page booklet comprising a report of the Cost Accounting Committee of the Institute, in which a basic cost system is presented which can be adapted to all types of heat-treating operations. **27**

MULTIPLE-PLATE CLUTCHES—Twin Disc Clutch Co., Racine, Wisc. Bulletin 306, descriptive of two models of Twin Disc oil-actuated multiple-plate clutches for general industrial use. Both models are adaptable to remote or push-button control with complicated actuating linkage. **28**

DUAL-RAM BROACHING MACHINES—Colonial Broach Co., Detroit, Mich. Bulletin RT-54, giving tabulated data on eleven different models, including two new machines—a 15-ton, 90-inch model and a 25-ton, 90-inch model. Illustrations show the electronic and hydraulic control panel arrangements, and the cooling filter systems. **29**

KEYWAY BROACHING—du Mont Corporation, Greenfield, Mass. Catalogue giving data on the company's line of "Minute Man" keyway broaches and bushings. Broaches that are available for special applications are also shown. Useful reference information on keys and keyways is included. **30**

COATED ABRASIVES—Behr-Manning Corporation, Troy, N. Y. 60-page handbook entitled "Production Digest," containing twenty articles written by methods engineers on the techniques of grinding and polishing with coated abrasives, illustrated by 122 photographs, 16 drawings, and 4 check lists. The manual concludes with advice on eight ways of cutting costs. **31**

LATHES—Sheldon Machine Co., Inc., Chicago, Ill. 24-page booklet containing concise information and specifications on Sheldon lathes now in production. One section, entitled "How to Select Your Sheldon Lathe," is intended to assist purchasing agents and shop superintendents in selecting a lathe most suited to their job requirements. **32**

ELECTRICAL DISCHARGE MACHINING—Electrosize, Inc., Schiller Park, Ill. Folder describing the company's facilities for electrical discharge machining. Basically, the service is built around a precision method of removing metal by a series of electrical discharges operating in a coolant bath of dielectric oil. **33**

MAGNETIC BASE INDICATOR HOLDER—Cullen Mfg. Co., Racine, Wis. Catalogue 755, featuring Erick Magna-Holders, magnetized holding devices available in a variety of styles for use in tool-rooms, and lay-out, inspection, maintenance, and production operations. **34**

BRINELL HARDNESS TESTER—Steel City Testing Machines, Inc., Detroit, Mich. Leaflet describing the "color-glance" Brinell hardness tester which automatically indicates the relative hardness of parts being tested on a production basis—yellow, being too hard; green, within range; and red, too soft. **35**

HACKSAWS—Atkins Saw Division, Borg-Warner, Indianapolis, Ind. Pocket-size Catalogue 24, dealing with hacksaws, hacksaw blades, and various types of hardware. Designed as a working catalogue, it tells where each saw is used, who uses it, and to what advantage. **36**

REBUILT MACHINE TOOLS—Miles Machinery Co., Saginaw, Mich. Card (Form 3547) listing a special offering of guaranteed reconditioned machine tools, including boring machines, drilling machines, gear machinery, grinders, engine and turret lathes, milling machines, presses, shapers, and a tapping machine. **37**

DIAMOND WHEELS—Wickman Mfg. Co., Oak Park, Detroit, Mich. 24-page booklet giving pertinent information on Wickman resinoid-bonded diamond wheels and Wickman-Neven steel-bonded diamond wheels, as well as instructions for using them. **38**

HELICAL CARBIDE-TIPPED END-MILLS—Wendt-Sonis Co., Hannibal, Mo. Folder describing a new line of helical carbide-tipped end-mills and shell end-mills. Prices, specifications, and applications of these Shear-Carb mills are given. . . . **39**

DIE-CASTING MACHINES — Hydraulic Press Mfg. Co., Mount Gilead, Ohio. Bulletin 5400 entitled "A New Approach to Die Casting," listing forty features of the company's new die-casting line, and pointing them out on a large phantom photograph. **40**

VALVES—Edward Valves, Inc., East Chicago, Ind. Catalogue 105, containing condensed data on the latest Rockwell-built Edward valves. These valves are built primarily for steam, water, oil, and gas, and are suitable for a wide range of pressures, temperatures, and fluids. **41**

OILLESS BEARINGS—Wakefield Bearing Corporation, Wakefield, Mass. 40-page

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catalogue describing the oilless and self-lubricating bearings, bushings, and machine parts manufactured by Wakefield. This catalogue also celebrates the 50th Anniversary of the concern. 42

INSTRUMENT FOR INSPECTING BALL BEARINGS—Micrometrical Mfg. Co., Ann Arbor, Mich. Folder descriptive of the Anderometer, a high-speed shop instrument for measuring the characteristics of assembled ball bearings that result in noise and vibration. 43

AIR GAGES—Taft-Peirce Mfg. Co., Woonsocket, R. I. Folder on automatic gaging and size control, presenting typical examples of high-speed gaging with air, as well as a description of air-electric CompAIRators. An automatic sorting machine with a minimum sorting rate of 1000 parts per hour is also described. 44

WIRE STRAIGHTENING AND CUTTING MACHINES—Lewis Machine Co., Cleveland, Ohio. Bulletin 55-1 descriptive of sixteen models of the newest wire straightening and cutting machines, and presenting a chart to aid in selecting the machine to meet specific production requirements. 45

STAINLESS-STEEL CHART—Alloy Metal Wire Division, H. K. Porter Co., Inc., Prospect Park, Pa. Wall chart listing over twenty different stainless-steel alloys and their properties in the martensitic, ferritic, and austenitic groups. Complete engineering properties are presented. ..46

HARD-FACING—Wall Colmonoy Corporation, Detroit, Mich. Bulletin describing the new Model C Spraywelder, a metal powder spraying unit used in welded overlay type hard-facing applications. The Colmonoy alloys available for use with this model are described. ..47

MACHINING OF ALUMINUM—George Sall Metals Co., Inc., Philadelphia, Pa. Bulletin on machining aluminum, covering pertinent data on types and shapes of tools, preparation of drills, tool materials, tapping and threading, reaming, spinning, sawing, and lubricants. 48

TUMBLING METAL AND PLASTIC PARTS—Tumb-L-Matic, Inc., New York City. Bulletin P-55, descriptive of the company's tumbling barrels and compounds for finishing metal and plastic parts and other materials. Both wet and dry, and combination processes are considered. 49

ENGINEERING SERVICE—Pioneer Engineering & Mfg. Co., Inc., Detroit, Mich. Bulletin PE-25, describing such services as product design and development, manufacturing cost studies, and production engineering offered by the company. 50

CEMENTED-CARBIDE BLANKS—Firth-Loach Metals, Inc., McKeesport, Pa. Catalogue 1, describing the complete line of Firlomet cemented-carbide blanks, as well as illustrating the company's production and laboratory equipment ..51

POWER TOOLS—Duro Metal Products Co., Chicago, Ill. 16-page catalogue explaining the advantages of Duro Master work-shop, which can operate up to seven power tools, each a complete unit, with a single motor. 52

ALUMINUM BRONZES—WW Alloys Inc., Division of Fansteel Metallurgical Corporation, Detroit, Mich. Bulletin 15.100, giving technical data on the properties of eighteen grades of aluminum bronzes. Suggested applications are listed. 53

ELECTRIC RESISTANCE WELDING—Sciaky Bros., Inc., Chicago, Ill. Bulletin 333, comprising 12 pages on industrial applications, manufacture and service, principles of operation, and types of Sciaky electric resistance welding machines. 54

PRECISION FINISHING OPERATIONS—American Wheelabrator & Equipment Corporation, Mishawaka, Ind. Bulletin 451-D, dealing with the wet abrasive blasting process. Forty applications in which Liquamatte wet blasting can profitably be used are presented. 55

OIL-TIGHT UNITS FOR INDUSTRIAL SERVICE—General Electric Co., Schenectady, N. Y. 16-page Bulletin GEA-5779B, containing concise information on oil-tight push-buttons, selector switches, and accessories. 56

SURFACE FINISHING—Surface Finishes, Inc., Addison, Ill. Leaflet presenting information on lapping, honing, and grinding. Illustrated are some examples of micro-inch finishes. 57

ALUMINUM SCREW MACHINE STOCK CALCULATOR—Kaiser Aluminum & Chemical Corporation, Oakland, Calif. Slide-rule type quantity-weight calculator, designed to aid in making quick stock requirement estimates on aluminum parts. 58

SANDING MACHINE—Detroit Surfacing Machine Co., Detroit, Mich. Leaflet descriptive of an air-powered dual-action sanding machine, which moves in two directions at the same time. 59

FIRE-RESISTANT - INDUSTRIAL HYDRAULIC FLUID—Monsanto Chemical Co., St. Louis, Mo. 20-page booklet on Pydraul F-9, a fire-resistant fluid for hydraulic equipment operating near possible sources of ignition. 60

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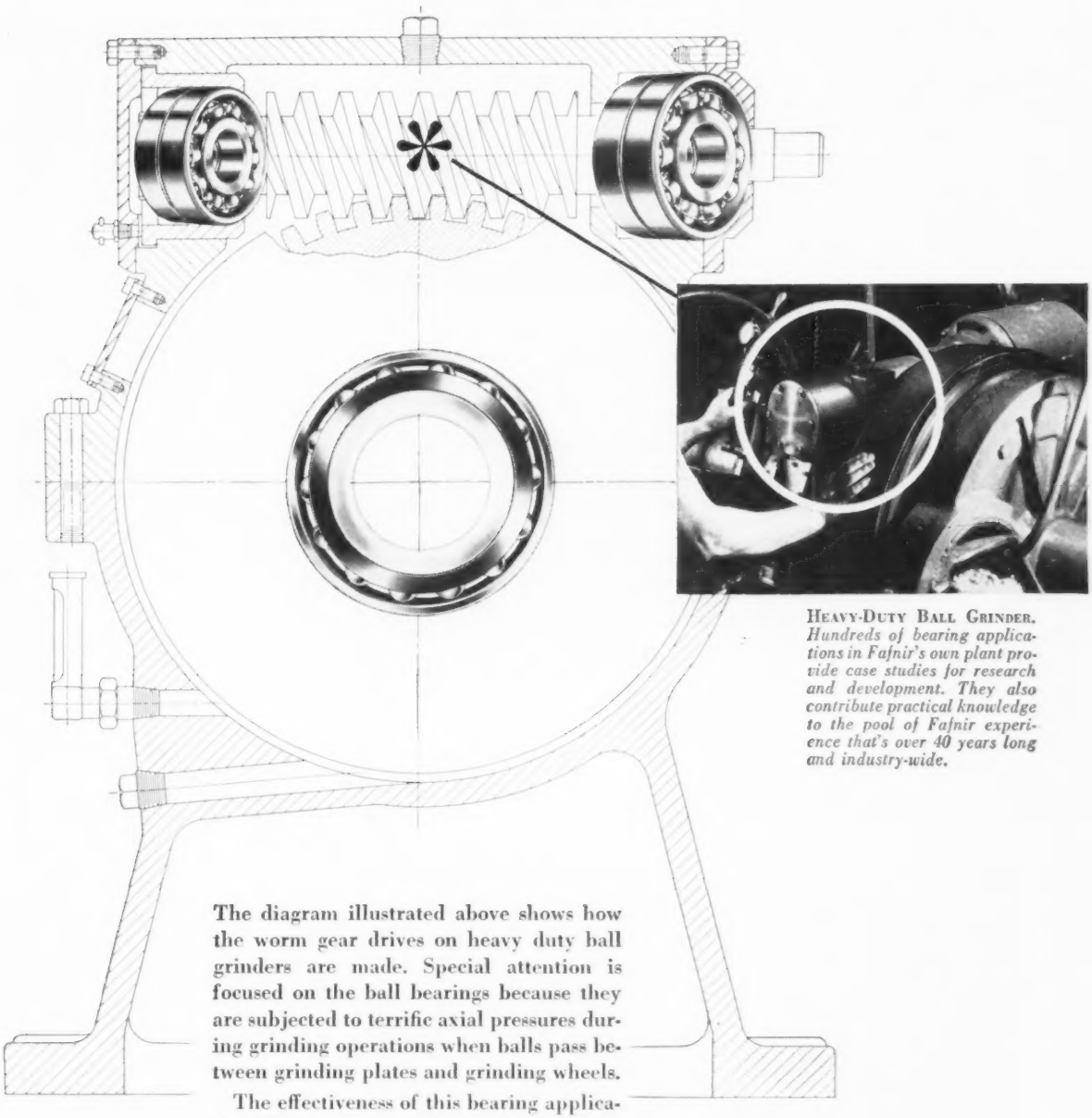
More Turns For The Worm

on Fafnir Ball Bearings



HEAVY-DUTY BALL GRINDER. *Hundreds of bearing applications in Fafnir's own plant provide case studies for research and development. They also contribute practical knowledge to the pool of Fafnir experience that's over 40 years long and industry-wide.*

The diagram illustrated above shows how the worm gear drives on heavy duty ball grinders are made. Special attention is focused on the ball bearings because they are subjected to terrific axial pressures during grinding operations when balls pass between grinding plates and grinding wheels.

The effectiveness of this bearing application is a matter of record. On the worm gear shaft illustrated, the duplex pairs of bearings have been in operation for 16 years without replacement . . . protecting the worm gear by rigidly locating its shaft and affording adequate carrying capacity for the combined radial and heavy thrust loads.

If you have similar equipment, maybe we can help extend its service life. The Fafnir Bearing Company, New Britain, Conn.

FAFNIR

BALL BEARINGS

MOST COMPLETE LINE IN AMERICA

BROWN & SHARPE MFG. CO., Providence, R. I., has sold its hob business to the BARBER-COLMAN CO., Rockford, Ill., its hob manufacturing equipment now being moved to Rockford.

JOHN W. HIGGINS has been appointed St. Louis, Mo., district sales manager by the Columbia Tool Steel Co., Chicago Heights, Ill.

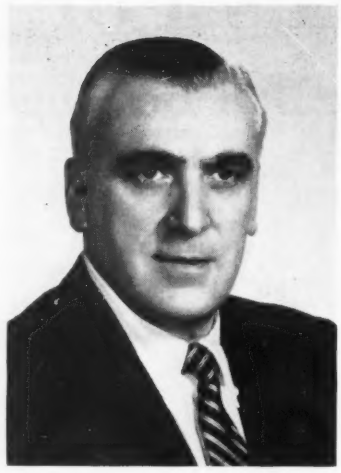
KENNAMETAL, INC., Pittsburgh, Pa., announces that the Indianapolis office of the Cincinnati district will be known as the Indianapolis branch. FRANK HILL, who has been a representative in the Cleveland district, will serve as branch manager. GEORGE SUNDELL, a service engineer in Buffalo, will become representative in Indianapolis in Mr. Hill's stead.

Michigan

OMER E. ROBBINS has been elected a director of the Ex-Cell-O Corporation, Detroit, Mich. Mr. Robbins was formerly president of the Robbins Engineering Co., which was acquired by Ex-Cell-O in 1948, but retired from this position early in 1951.

E. J. WELLER, carbide design and application engineer in the Carboloy Department of General Electric Co., Detroit, Mich., has been named manager of tool sales, with headquarters at Detroit. Mr. Weller, who has been with Carboloy since early 1954, began his career with the General Electric Co. in 1937 as an apprentice machinist in the Turbine Division in Schenectady, N. Y. He then became a diemaker and later was transferred to the materials and process laboratory of the Division.

E. J. Weller, manager of tool sales for the Carboloy Department of General Electric Co.



George N. Popham, president and general manager of the Gorham Tool Co.

GEORGE N. POPHAM was recently elected president and general manager of the Gorham Tool Co., Detroit, Mich., producer of standard and special high-speed steel and carbide-tipped cutting tools. Mr. Popham, who served as vice-president and sales manager of the concern for the last thirteen years, succeeds DON T. FLATER. Mr. Flater resigned his position to devote himself to other business interests. Mr. Popham has been an active member of the cutting tool industry for twenty-five years.

E. W. BLISS CO., Canton, Ohio, recently announced the completion of its new can machinery plant at Hastings, Mich. The plant will produce a complete line of can and container-making machinery. FREDERICK B. PORTEOUS, formerly chief engineer of the Hastings Division, has been appointed manager of the plant.

Frederick B. Porteous, manager of Hastings can machinery plant of the E. W. Bliss Co.

ERNEST E. GEORGE, manager of magnetic products engineering at the Carboloy Department of General Electric Co., Detroit, Mich., has been appointed plant manager of the Department's permanent magnet plant in Edmore, Mich. Mr. George became associated with the General Electric Co. in 1933 as a test engineer, and joined Carboloy as manager of magnetic materials in 1950.

BOHN ALUMINUM & BRASS CORPORATION, Detroit, Mich., announces the following appointments: T. W. KUHN, executive vice-president, and C. M. ADAMS, vice-president.

Missouri, Colorado, and Texas

VICKERS, INC., Detroit, Mich., has reopened its district sales office in St. Louis, Mo., in order to provide added application engineering and service assistance to users of oil-hydraulics in the Midwest. ROBERT H. MEZGER has been appointed district sales manager there. He was formerly associated with the Chicago district sales office.

J. W. MULL, JR., manufacturers' representative of production tools in Indianapolis, Ind., has recently opened its fourth branch office, this one at 34 N. Brentwood Blvd., St. Louis, Mo. GEORGE WARREN DUKE is in charge.

AMERICAN SIP CORPORATION, New York City, United States distributor of the Sip jig borers and high precision measuring equipment, has appointed the OVERGARD MACHINE TOOL CO. as representative in Colorado and Utah. The latter company is located at 2045 W. 8th St., Denver, Colo. CARL M. OVERGARD, RAY ANDERSON, and ARNOLD SCHICHLER are on the staff.

D. G. GIBSON has been appointed district manager for the Dallas, Tex., territory by the Timken Roller Bearing Co., Canton, Ohio, succeeding the late Harry W. Trump. Mr. Gibson, who has been with the company since 1938, was assistant district manager in the Dallas office at the time of his promotion.

New England

JOHN C. MOLINAR has been elected vice-president and general sales manager of the Niles-Bement-Pond Co., West Hartford, Conn. Mr. Molinar will be responsible for both the

GET G.S. TECHNICAL DATA *Free!*

See where and how we mass-manufacture Small Gearing to uniformly fine tolerances. Folder contains 23 pictures of Small Gears, plant views, as well as Diametral and Circular Pitch Tables. Ask for your copy on company stationery, please!

Isn't it about TIME you start using G.S. Small Gearing?

You'll find it about the easiest and most profitable thing you ever did . . checking up on the *better* Small Gearing we make. Just follow the suggestion you see above. Get this Technical Service Bulletin. Read it . . keep it . . and specify "G.S." on the very next lot of Small Gears you need. If a new product is involved, call us in at the "drawing board" stage. Precision-minded manufacturers from coast-to-coast are doing this to their profit and satisfaction. First shipments invariably result in repeat orders . . *constant* customers who depend upon us year after year for quantity runs of Small Gearing which uniformly meet the most *exacting* specifications!

FRACTIONAL HORSEPOWER GEARING

GS

GEAR Specialties, Inc.

2635 WEST MEDILL AVENUE
CHICAGO 47, ILLINOIS

SPURS • SPIRALS • HELICALS • BEVELS • INTERNALS
WORM GEARING • RACKS • THREAD GRINDING

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARING

(Left) John C. Molinar, vice-president and general sales manager of Niles-Bement-Pond Co.; and (right) James D. Allan, who will direct machinery sales of all Niles-Bement-Pond divisions

domestic and foreign sales activities, and will also direct the advertising and market research departments. He has been with the company since 1922 in various sales capacities until his appointment in 1950 as manager of domestic cutting tools and gage sales, the position he held until his present promotion. JAMES D. ALLAN, who was manager of domestic machinery sales of Pratt & Whitney, will direct the machinery sales of all divisions of the Niles-Bement-Pond Co. Mr. Allan joined the Pratt & Whitney organization in 1923 as a machinery salesman and was later appointed Cleveland district machinery sales manager. In 1948, he was transferred to the main office at West Hartford, and two years later, assumed the post of manager of domestic machinery sales. Three other promotions announced for the Pratt & Whitney Division are as follows: A. S. BURGOYNE, manager of domestic gage sales; A. F. MILLER, JR., manager of domestic cutting tool and precision parts sales; and J. B. WILKIE, assistant manager, cutting tool and gage divisions.

FRANK T. CAMPAGNA has been named sales manager of the eastern division of the American Felt Co., Glenville, Conn., succeeding the late Philip H. Lang. Mr. Campagna was formerly an engineer in charge of the company's engineering and research division at Glenville.

THE BULLARD CO., Bridgeport, Conn., has begun construction of a foundry that will cost about $6,000,000. It is expected that the new foundry will be in operation by the end of 1955.

THORVALD S. ROSS has resigned as president and general manager of Rivett Lathe & Grinder, Inc., Boston, Mass., but will continue as an advisor and as chairman of the board. ALBERT B. HUNT has been elected president and treasurer of the company, and THOMAS B. WILLIAMS, vice-president.

JAMES H. WOLCOTT has become Western sales manager for the Reed-Prentice Corporation, Worcester, Mass., an affiliate of the Package Machinery Co. Mr. Wolcott will have his headquarters at 4001 N. Elston Ave., Chicago, Ill.

F. W. MCINTYRE, SR., has retired as chairman of the board of the Reed-Prentice Corporation, Worcester, Mass. With the concern for thirty-five years, Mr. McIntyre is now acting in a consulting capacity.

New York

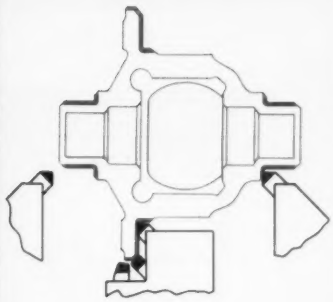
REVERE COPPER & BRASS, INC., New York City, has purchased STANDARD ROLLING MILLS, INC., producer of aluminum foil products since 1926, with plants in Brooklyn, N. Y., Chicago, Ill., and Newport, Ark. The newly acquired company will be known as the STANDARD ROLLING MILLS DIVISION OF REVERE COPPER & BRASS, INC. JOSEPH H. KONIGSBERG, with Standard Rolling Mills since 1926 and its president since 1938, has been elected a vice-president of Revere and will continue to supervise the activities of the new Division.

HARRY C. PLATT was recently elected executive vice-president of the Engineered Castings Division of the American Brake Shoe Co., New York City. Mr. Platt, who was vice-president of the Division at the time of his promotion, will continue to be located at its headquarters in Rochester.

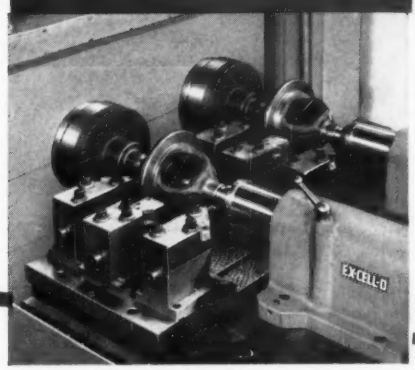
JORDAN P. FREEMANTLE has joined the Butterfield Division of the Union Twist Drill Co., Derby Line, Vt., having been appointed sales engineer in the New York and northern New Jersey areas. He will have his headquarters in New York City.

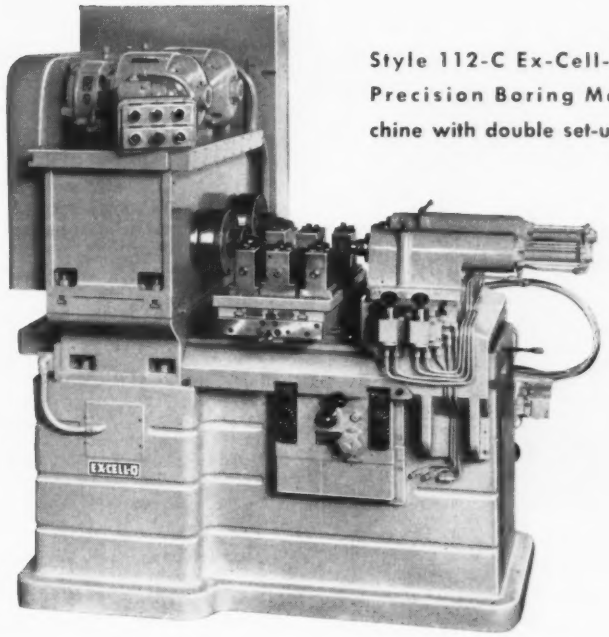
JOHN B. PERKINS, vice-president, tool sales, of J. H. Williams & Co., Buffalo, N. Y., manufacturer of industrial and automotive wrenches, tools, and drop-forgings, will slowly taper off his activities until December 31, 1955, at which time he will transfer to the West Coast to take charge of the company's Los Angeles, Calif., office until his retirement. Also announced were the appointments of EDWARD R. BURKARDT as sales manager and GERALD W. CARUSO, as assistant sales manager.

(Left) John B. Perkins, vice-president, tool sales, of J. H. Williams & Co. (Right) Edward R. Burkardt, sales manager



Heavy lines show the surfaces machined.





Style 112-C Ex-Cell-O Precision Boring Machine with double set-up.

Close-up of the two differential cases, in work position. This precision work is done with hydraulic feeds and easily-controlled automatic cycles.

Insure your Profits...

with DOUBLED PRODUCTION on Ex-Cell-O STANDARD MACHINES

XLO
EX-CELL-O for PRECISION

A NEW APPROACH . . . Turn four diameters—face three shoulders—chamfer one edge. Not one at a time—but *Two!* Not on a double end—but on a single end Ex-Cell-O Precision Boring Machine!

Workpieces are automotive differential cases—precision work—limits of plus or minus .0005" on diameters.

See how Precision Boring Machines can save time and money for you. Call your local Ex-Cell-O representative, or phone or write Ex-Cell-O for a Precision Boring Catalog.

54-21

EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN

MANUFACTURERS of PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Colonel P. L. Houser, who is the newly elected president of the Metal Cutting Tool Institute

COLONEL P. L. HOUSER has been elected president of the Metal Cutting Tool Institute, succeeding MASON BRITTON, who has become vice-chairman. Colonel Houser was general supervisor, manufacturing standards research, at the International Harvester Co. GEORGE F. HOLLAND, president of the Union Twist Drill Co., has been made chairman of the board of the Institute.

CONSOLIDATED MACHINE TOOL CORPORATION, Rochester, N. Y., a subsidiary of the Farrel-Birmingham Co., Inc., Ansonia, Conn., has been dissolved as a separate corporation. Its business and activities will now be conducted as a division of the parent corporation under the name of the CONSOLIDATED MACHINE TOOL CO., a DIVISION OF FARREL-BIRMINGHAM CO., INC.

DOUGLAS P. FERGUSON has joined The Carborundum Company, Niagara Falls, N. Y., having been appointed Ferrocarbo engineer in the abrasive engineering department of the Bonded Products and Grain Division. Mr. Ferguson was formerly chief metallurgist of the Wilson Foundry Division, Willys Motors, Inc.

EDWARD W. SPARKES has been named acting manager of the sales branch for the Syracuse, N. Y. area of the Crucible Steel Company of America, Pittsburgh, Pa. Mr. Sparkes joined Crucible in 1935, and was most recently a sales service engineer at Syracuse.

EDWIN C. EVANS has been named vice-president and assistant general manager of the Behr-Manning Corporation, Troy, N. Y. WILLIAM I. CLARK, JR., who is secretary of the company, has been made assistant to the president, in addition to his present duties.

SENECA FALLS MACHINE CO., Seneca Falls, N. Y., is constructing a building adjacent to its main plant to house the newly formed Electronics Division, as well as its engineering department.

OLIVER A. GOTTSCHALK has been appointed assistant to the president of The Carborundum Company, Niagara Falls, N. Y. Mr. Gottschalk was formerly assistant controller.

EMMET F. HARDING has resigned as sales manager of the Russell, Burdsall & Ward Bolt and Nut Co., Port Chester, N. Y.

North Carolina, Washington, D. C., and Georgia

GEORGE M. ROBERTS has been named district sales manager at Charlotte, N. C., for the Delta Power Tool Division of the Rockwell Mfg. Co., Pittsburgh, Pa. He will make his headquarters at his new residence, 366 Hillside Ave., Charlotte. Mr. Roberts is well known in the tool and machinery field throughout the Southeast.

WHITING CORPORATION, Harvey, Ill., has established a district office for the Southeast, its location being 1610 Liberty Life Bldg., Charlotte, N. C. FRED W. FISHER has been appointed manager there.

EVERETT O. CLARK, who is manager of industrial products sales for Vickers, Inc., Detroit, Mich., has been appointed the first director of the General Industrial Equipment Division of the Business and Defense Services Administration, United States Department of Commerce, Washington, D. C. Mr. Clark is on loan to BDSA from his Vickers position.

FRED L. BISHOP has been named manufacturers' representative for the Horton Chuck Division of the E. Horton & Son Co., Windsor Locks, Conn. With headquarters in Atlanta, Ga., Mr. Bishop will cover Virginia, North Carolina, South Carolina, Georgia, and Florida.

Ohio

E. HUGH JONES has been promoted to operations manager of the Lima and Fostoria, Ohio, plants of the Ex-Cell-O Corporation, Detroit, Mich., while RICHARD A. LODGE has been made assistant sales manager in charge of sales at the same plants. Mr. Jones joined the concern in 1936 and served in supervisory administrative capacities in both the Machinery and Jet Engine Divisions. During the past two years, he has been in charge of jet blade and rotor production. Mr. Lodge joined Ex-Cell-O in 1939 as an engineer in the Fuel Injection Division. For several years, he has been associated with aircraft operations.

E. Hugh Jones, operations manager of the Lima and Fostoria plants for the Ex-Cell-O Corporation

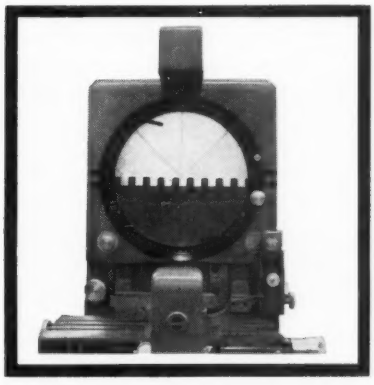
EATON MFG. CO., Cleveland, Ohio, announces that its Stamping Division, located now at 739 E. 140th St., will be moved to the recently acquired plant and office space of the Bryant Heater Division of Affiliated Gas Equipment, Inc., 17877 St. Clair Ave. Eaton's Axle Division, which is also at the 140th St. location, will now utilize the floor area of the Stamping plant. As a result of this acquisition, the Stamping Division will increase its manufacturing floor space by 40 per cent.

ARTHUR H. VAN WORMER has been made district sales manager in Cleveland, Ohio, for Vickers, Inc., Detroit, Mich. He replaces PAUL SIMONDS, who has retired after thirteen years of service. Mr. Van Wormer will be responsible for providing application engineering and service assistance to users of industrial and mobile oil-hydraulic products in the Cleveland area.

ABRASIVE & METAL PRODUCTS CO., Detroit, Mich., has purchased the Sterling Abrasives Division, Tiffin, Ohio, of the Cleveland Quarries Co. The name of the Division has been changed to STERLING GRINDING WHEEL CO., and will be operated as a subsidiary of the Abrasive & Metal Products Co.

HARRY COTESWORTH has been advanced to chief engineer of the development department of the Cleve-

Saved . . . 296 pieces per thousand!



Like many another manufacturer, the Hoover Company, Canton, Ohio, has its rejection problems. A typical one involved a flexible, rubber-like "litter picker" used in its vacuum cleaners. Although tolerances ranged from .085″ to .101″, rejects ran as high as 30%.

To solve this problem, Hoover employed a Kodak Contour Projector to measure the parts, plotted results in accordance with modern methods of statistical quality control. Based on these studies, alterations were made in the cutting tool and the holding fixture for the part. Rejects dropped from 30% to less than ¼ of 1%. Savings amounted to 296 pieces per thousand.

"Optical gaging with the Kodak Contour Projector," say Hoover engineers, *"eliminated incorrect readings caused by mechanical distortion of the parts. In addition, optical methods of measurement proved from 4 to 5 times faster than conventional gaging techniques."*

Your own production measurement or inspection problem may similarly be solved by optical gaging with a Kodak Contour Projector. To find out more about it, send the coupon for your copy of "The Kodak Contour Projector."

the KODAK CONTOUR PROJECTOR

91

EASTMAN KODAK COMPANY
Special Products Sales Division, Rochester 4, N. Y.

Please send me a copy of your booklet, "The Kodak Contour Projector."

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____
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Kodak
TRADE-MARK

(Left) Harry Cotesworth, chief engineer of the development department of Cleveland Crane & Engineering Co. (Right) Kurt R. Weise, chief engineer of the Cleveland Tramrail Division

land Crane & Engineering Co., Wickliffe, Ohio. He has been with the company for twenty-five years and is responsible for many improvements made on cranes and tramrail equipment. KURT R. WEISE has been appointed chief engineer of the Cleveland Tramrail Division. He has been with the company for thirty-one years, and is widely known in the materials-handling equipment field.

R. S. CARSON has been appointed district manager for the East Central territory of the Oilgear Co., Milwaukee, Wis. With headquarters in Cincinnati, Ohio, Mr. Carson will have the following field engineers assisting him: ENOCH D. DAVIES, OTTO F. KLIEVE, and GILBERT W. UECKER.

WESSON METAL CORPORATION, Lexington, Ky., has announced the start of production in its new 40,000-square foot cemented-carbide metals plant. Its productive capacity has been doubled and its research and development facilities expanded.

Pennsylvania

WILLIAM H. MCCORMICK has been named manager of sales of the Park alloy and carbon division of the Crucible Steel Company of America, Pittsburgh, Pa. In addition to supervising the division, he will be available as a consultant to other sales divisions of the company which use the facilities at the Park Works. Mr. McCormick was formerly chief metallurgist there. HERBERT WHELAN, assistant manager at Crucible's Chicago branch sales office and warehouse, has become warehouse merchandising consultant. Both men began their careers with Crucible in 1923. FELIX KREMP has been elected assistant manager of the tool steel sales division, the products of which are manufactured at the Park Works. All three men will have their headquarters in the Oliver Bldg., Pittsburgh, Pa.

A. R. GAUS was recently elected vice-president of the Erie Forge & Steel Corporation, Erie, Pa. Mr. Gaus was formerly associated with the Midvale Co., where he was vice-president for twenty years.

NORRIS H. SCHWENK has been appointed general manager, and JAMES J. NELSON, sales manager, of the Foundry Department of the Baldwin-Lima-Hamilton Corporation, Philadelphia, Pa.

RAYMOND W. WIEHSNER, a design engineer for the Tabor Mfg. Co., Tacony, Pa., has been appointed sales manager of the company, which is a division of the Turbo Machine Co., Lansdale, Pa.

HOWARD MURRAY has been appointed general manager of sales by the Philadelphia Gear Works, Philadelphia, Pa. He was formerly in charge of the Houston, Tex., office. Mr. Murray has been with the company since 1947.

Wisconsin, Minnesota, and Iowa

GISHOLT MACHINE CO., Madison, Wis., has announced the following retirements: ALFRED B. MOREY, vice-president and treasurer, who has been with the company forty-one years; F. M. LONG, director of foreign sales, with forty-eight years of service; C. K. SWAFFORD, vice-president, who is retiring the end of this month, having been with Gisholt for forty-two years; U. S. JAMES, Detroit sales office manager, with forty-two years of service; and HAROLD EARL, Moline sales office manager, with thirty years. The following new appointments have been made: E. K. BAXTER will replace Mr. James in the Detroit office; and ROBERT WELLMAN, who assisted Mr. Earl, will now manage the Moline office. Also announced was the appointment of A. G. HOFFER, former general plant superintendent, to the position of works manager.

J. F. HOHEISEL, a sales engineer in charge of the Dayton, Ohio, branch office for the Allen-Bradley Co., Milwaukee, Wis., has been transferred to the Cleveland office. WALTER F. HAMMER, who was a sales engineer at Cincinnati, will replace Mr. Hoheisel at the Dayton office, which is under the jurisdiction of the Cincinnati office. HAROLD MITTELMAN has been added to the Cincinnati sales engineering staff, and ROBERT L. GOVE has been assigned to the Detroit office as sales engineer.

CHARLES H. HAWKS, who was in charge of the Flint, Mich., branch of the Detroit office of Allen-Bradley Co., Milwaukee, Wis., has been appointed district manager of the Pittsburgh, Pa., office. He succeeds HARRY THORNBERRY, who will open the sales engineering office in Bridgeport, Conn. T. C. HERBES, a sales engineer in Detroit, has been named manager of the Flint office, succeeding Mr. Hawks.

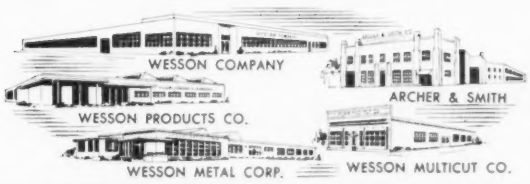
WILLARD G. HARTMAN has been appointed a representative by the Continental Screw Co., New Bedford, Mass. His offices are located in the First National Bank Bldg., St. Paul, Minn. Mr. Hartman's territory includes Minnesota and the Dakotas.

W. H. SCHULZ CO., INC., 2438 Franklin Ave., St. Paul, Minn., has been appointed representative in the St. Paul area by the COLUMBIA TOOL STEEL CO., Chicago Heights, Ill.

ALUMINUM COMPANY OF AMERICA, Pittsburgh, Pa., has announced a major addition for its aluminum rolling equipment at the Davenport Works, Davenport, Iowa, which will cost more than $5,000,000.

Canada

JESSE A. GILES has been made manager of the Toronto, Canada, plant of A. Schrader's Son, Division of Scovill Mfg. Co., Inc., Brooklyn, N. Y. The Schrader concern manufactures tire valves and air control products. DONALD H. STOREY has been appointed assistant manager of the Schrader tire valve manufacturing plant in Toronto.



carbide NEWS

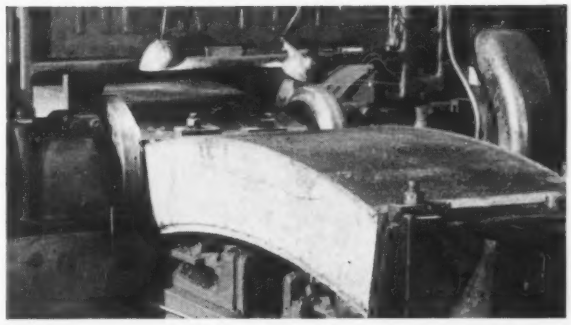
Output Jumps On Tough Job

Wessonmetal standard grades outperform all other tool materials tried on huge steel and cast iron tunnel segments

Typical of new performance records being reported for Wessonmetal carbides is the milling of 7-foot steel and cast iron segments for the new Lincoln tunnel addition using homemade 20-inch catheads.

High speed steel tools could not finish a single segment before burning up due to heavy sand inclusions. Other carbides also broke up or wore excessively. Part of the trouble resulted from the use of 28-year-old duplex millers for the machining operation.

When Wessonmetal grades "M" and "GS" were put on the job, the trouble was licked and 100 to 180 segments were produced per grind. Both Grade M, used on the steel segments, and Grade GS, used on the cast iron segments, have inherently high wear resistance and are designed for heavy shock applications.



Giant tunnel segments being milled with Wessonmetal carbides. Two segments are milled per setup. Large sand inclusions are evident on side of rough casting.

Two segments are milled per setup, averaging 35 minutes. Machines are operated at a maximum speed of 110 sfm with a feed of 6 ipm on the steel segments and 14 ipm on cast iron.

Average depth of cut ranges from $\frac{3}{8}$" to $\frac{1}{2}$", although it has often exceeded $\frac{7}{8}$". The catheads are equipped with 15 style BR Wesson lathe tools held in place by two set screws.

Throw-Away Broach Teeth Give Four Carbide Edges, Eliminate Grinding

Elimination of all grinding and fast one-hand indexing to present any of four cutting edges are major advantages of the new-style carbide insert broach tool announced by Wesson Company.

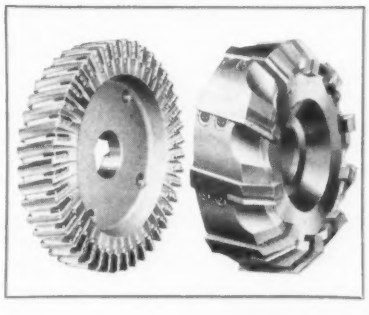
Seat for the carbide insert has a negative angle for maximum edge strength. The locking screw is flush with the top of the clamp, avoiding interference when loosening the lock holding the tool in broach bar.

New Rigidcuts Increase Economy, Milling Range

Two new Rigidcut inserted blade milling cutters, permitting higher feed rates and increased cutting depths are among recent Wesson Company developments.

Feeds of more than 100" per minute on cast iron finishing operations are now possible with the 7200 Series Rigidcut cutter. The new design, using over 4 blades per inch of diameter, eliminates one of the greatest obstacles to practical usage of high feeds on fine finishing operations.

Where a depth of cut up to $\frac{7}{8}$" is needed on cast iron or steel, the new 3100 Series Rigidcut provides the necessary rigidity and strength because of its extra thick body. Special $1\frac{1}{2}$" high Wessonmetal carbide tipped blades are locked in with Wesson Dual-Wedg locks. Rapid and accurate setup is assured by specially designed blade serrations.



Two newest cutters in Rigidcut line. Left to right: Cutter designed for high feed finishing; cutter for heavy duty cast iron and steel machining.

CARBIDE DATA

Additional information and specifications available:

☐ Specification data on new throw-away insert type broach tool design.

☐ Wesson Progress Report on boring.

Get data by writing to:
WESSON COMPANY, Dept. AD
1220 Woodward Heights Blvd.
Detroit 20, Michigan

tools Wesson carbide Wessonmetal

Reprint of Advertisement appearing in leading business publications.

Obituaries

E. Franklin Motch

E. Franklin Motch, president and treasurer of the Motch & Merryweather Machinery Co., Cleveland, Ohio, died at his home in Shaker Heights on January 6, at the age of

E. Franklin Motch

forty-six years. Mr. Motch, after graduation from Yale University, came to the company in 1933. During World War II, he served as commander in the United States Navy. In 1946, Mr. Motch was made vice-president and treasurer of the company, and in 1953, succeeded to the presidency.

Knud Engelsted

Knud Engelsted, chairman of the board and president of O. S. Walker Co., Inc., Worcester, Mass., manufacturer of magnetic chucks, died on

Knud Engelsted

December 14 at the age of sixty-six years. Mr. Engelsted was born in Svendborg, Denmark, and came to the United States when he was twenty-four years old. During World War II, he was a member of the War Production Board. He had many years of association with machine tool plants, including V. Lowener of Copenhagen, Denmark; Soderfors Steel Co., New York and branches; Electrol, Inc., Kingston, N. Y.; Globe Slicing Machine Co., Stamford, Conn., and Union Twist Drill Co., Athol, Mass.

National Broach Celebrates Twenty-Fifth Anniversary

The National Broach & Machine Co., Detroit, manufacturer of gear production machine tools, inspection equipment, and broaches, is now celebrating its twenty-fifth year of operation. The company, originator of the rotary crossed-axis gear-shaving process, was incorporated on November 29, 1929. Its founder, the late R. S. Drummond, bought a Dayton, Ohio, firm called the National Broach Co., and moved it to Detroit, Mich., where the company was formed under its present name.

* * *

Reviews of Available Films

SHELL-MOLDING

A twenty-five minute sound-slide film "Shell-Molding and You," designed to acquaint foundrymen, and buyers of foundry products, with the benefits of this casting process, has been announced by the Chemical Materials Department of the General Electric Co., Pittsfield, Mass. The film describes the advantages of shell-molding over other casting methods, and presents a step-by-step demonstration of shell-molding operations, as well as a brief history of metal-casting, in cartoon form.

RESISTANCE WELDING OF STAINLESS STEELS

A 16-millimeter motion picture film in both sound and color, which deals with the resistance welding of stainless steels, has been made available to schools, universities, and industrial plants by the Resistance Welder Manufacturers' Association, Philadelphia, Pa. The film, which was prepared by the Allegheny Ludlum Steel Corporation, runs for twenty-one minutes.

Coming Events

FEBRUARY 15-16—MACHINE TOOL BALL BEARING CONFERENCE to be held at the Hotel Statler, Hartford, Conn., under the auspices of the New Departure Division of General Motors Corporation.

MARCH 14-18—First Western Industrial Exposition sponsored by the AMERICAN SOCIETY OF TOOL ENGINEERS to be held at the Los Angeles, Calif., Shrine Auditorium and Shrine Exposition Hall. The exposition will run concurrently with the A.S.T.E. meeting. Executive Secretary, Harry E. Conrad, 10700 Puritan Ave., Detroit 21, Mich.

MARCH 28-APRIL 1—Ninth Western Metal Exposition and Congress sponsored by the AMERICAN SOCIETY FOR METALS and nineteen other technical societies to be held at the Pan-Pacific Auditorium and the Ambassador Hotel, respectively, Los Angeles, Calif. A.S.M. secretary, William H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

APRIL 13-15—Tenth annual Meeting and Lubrication Exhibit of the AMERICAN SOCIETY OF LUBRICATION ENGINEERS at the Hotel Sherman, Chicago, Ill. Administrative secretary, William P. Youngclaus, Jr., 84 E. Randolph St., Chicago 1, Ill.

MAY 16-20—SIXTH NATIONAL MATERIALS HANDLING EXPOSITION at International Amphitheatre, Chicago, Ill. For further information, write to Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

MAY 31-JUNE 3—THIRD BASIC MATERIALS EXPOSITION to be held at Convention Hall, Philadelphia, Pa. Further information can be obtained from Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

JUNE 8-10—Third Annual Welding Show under the sponsorship of the AMERICAN WELDING SOCIETY to be held at the Municipal Auditorium, Kansas City, Mo. National secretary, Joseph G. Magrath, 33 W. 39th St., New York 18, N. Y.

SEPTEMBER 6-17—Machine Tool Show sponsored by the NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION to be held at the International Amphitheatre, Chicago, Ill. Further information can be obtained from Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

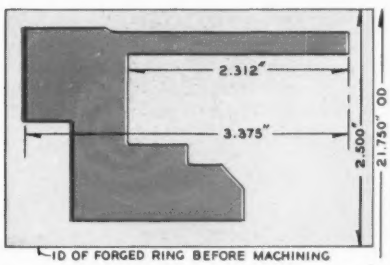
SEPTEMBER 6-17—PRODUCTION ENGINEERING SHOW, coinciding with the Machine Tool Show, to be held at the Navy Pier, Chicago, Ill. For further information, write to Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

Tough Jobs Are Naturals For Hydra-Feed Production Lathes

Maximum utilization of multiple carbide tooling on the model HD-24 Hydra-Feed lathes enables the tank transmission rings to be completely machined in three roughing and two finishing operations. Removal of approximately 368 cu. in. of metal during roughing demonstrates the high production rates possible with these new automatic lathes.

Unusually large chip capacity permits this high rate of metal removal without creating a chip disposal problem.

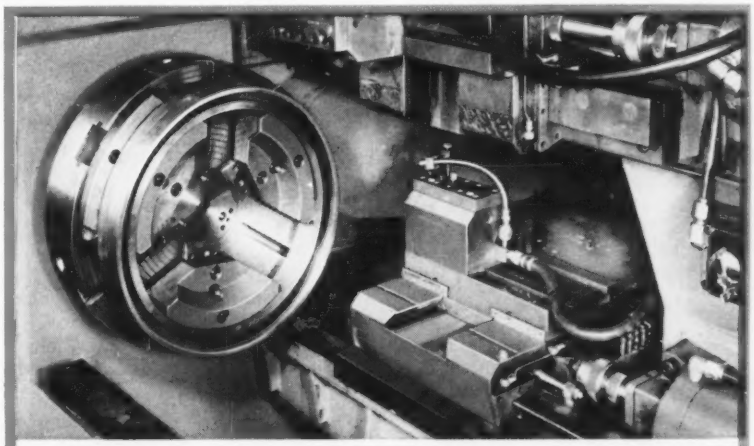
Handling of the large diameter rings is simplified by the unobstructed front that is a feature of all Hydra-Feeds. Short travel and the rapid advance and retract of all tools keeps cycle time to a minimum.



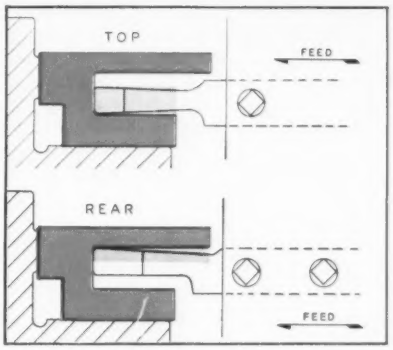
■ *Cross section of rolled and welded SAE 8740 steel tank transmission ring machined in automotive plant by battery of five Hydra-Feed automatic lathes. Metal removed is shown by shaded area. Finished OD is 21.500", ID is 17.950".*

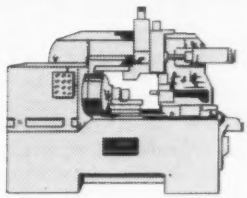
These model HD-24 lathes, the largest of the four standard sizes built by Hydra-Feed, are equipped for this job with 50 hp motors for roughing and 30 hp motors for finishing operations.

ASK FOR CATALOG to get the complete Hydra-Feed story. Learn how the Hydra-Feed automatic lathes can cut your costs, improve your quality.



PLUNGE CUT CYCLE TIME SLASHED





Both top and rear carriages feed longitudinally at the same time to cut groove in tank transmission ring. The ½" tool on top carriage leads the ⅝" tool by a slight amount.

Cycle time for this tough plunge cutting operation is only 3 minutes, compared with about 20 minutes formerly required to do the same job on another machine. Depth of groove is 2¼ inches, width is 1 inch. Feed is 0.015 with the cut being made at approximately 360-420 surface feet per minute.

Tools overlap ⅛ inch with the ½-inch tool on the top carriage leading the ⅝-inch tool on the rear carriage by a slight amount. Both tools feed longitudinally at the same time to produce this extremely short cutting cycle.

Work piece is held internally by a chuck equipped with special jaws having a large gripping area that reduces distortion of the ring.

Hydra-Feed lathes are today's answer to these requirements:

Maximum carbide performance (cam or tracer control)
Easy loading or automation (no front obstruction)
Maximum rate of metal removal (short tool travel)
Decreased maintenance (JIC throughout)
Smoothness (downward tool pressures and massive design)

HYDRA-FEED MACHINE TOOL CORPORATION
SOUTH NORWALK, CONNECTICUT AND DETROIT (Ferndale), MICHIGAN
Address all inquiries to
SALES AND ENGINEERING OFFICE, 730 W. EIGHT MILE ROAD, FERNDALE, MICHIGAN

Seventy-Five Years of Precision Toolmaking

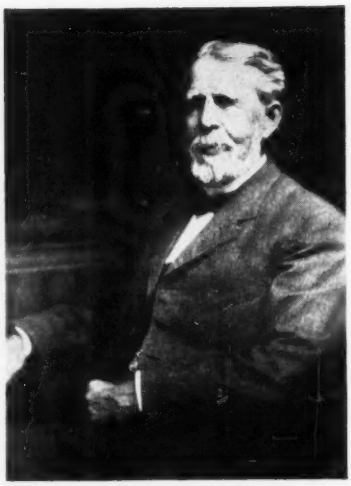
This year marks the Diamond Jubilee of precision toolmaking by the L. S. Starrett Co., Athol, Mass. In 1880, Laroy S. Starrett invented and began to manufacture the combination square, a tool that is still one of the basic and most useful items in a mechanic's kit. This event led to the development of a complete line of hand measuring tools and precision instruments.

In this broad period, the company expanded from a room in a small machine shop to the largest manufacturing plant in the world devoted exclusively to the production of mechanics' hand measuring tools and precision instruments, steel rules, steel tapes, dial indicators, gages, hacksaws, band saws, band knives, and precision-ground die and flat stock—more than 3000 items. A handful of craftsmen has become an organization with up to 2500 employes.

The combination square of 1880 afforded the mechanic a vast improvement over the crudely made fixed-blade try squares previously available. Not only was it a more accurate square but, with its sliding head and graduated blade, offered the additional advantages of a rule, square, straightedge, miter square, depth gage, height gage, transfer gage, level, and plumb. It also carried a scriber in a self-contained sheath. Later, a center head was added for finding the center of circles, and a bevel protractor.

In order to make square blades that were ground and graduated with sufficient accuracy, Mr. Starrett built machines of his own design to do the work. This led to the making of steel rules, including spring-tempered flexible rules which were superior to the thick, heavy, soft rules of that day. Steel measuring tapes were another logical development.

In 1887, spring-bowed calipers and dividers were additions to the line, and then the micrometer, a tool that originated in France. After many improvements in design, balance, and accuracy, Mr. Starrett began to manufacture micrometers in quantity. He had over one hundred patents in his name. Dial indicators and dial gages are other products of importance and variety. Starting in 1920 with an indicator designed to check the curvature of spectacles, the line has increased to hundreds of different instruments. Precision-ground die and flat stock is a line which grew out of a knowledge of products and customer requirements. Special events during the Diamond Jubilee Year will include the announcement of a considerable number of new tools and the release of a de luxe catalogue.



Laroy S. Starrett, inventor of the combination square and other mechanics' tools, and founder of the L. S. Starrett Co.

(Left) Small machine shop where the first Starrett combination squares were manufactured

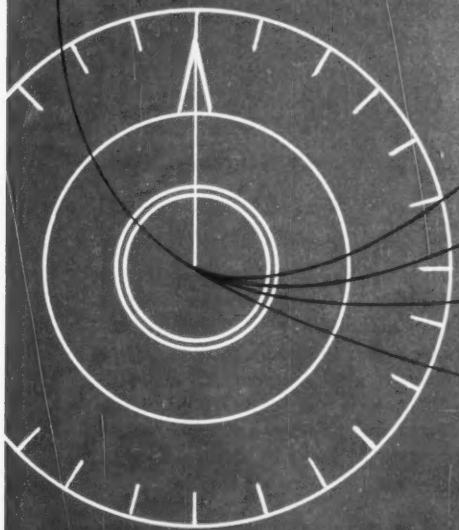
(Below) The present-day plant of the L. S. Starrett Co. is the world's largest devoted to the manufacture of mechanics' hand measuring tools and precision instruments.

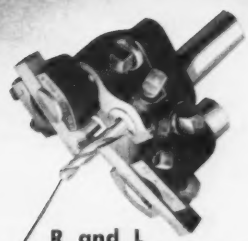
RIGHT R AND LEFT L TOOLS

your combination . . .

TO LOWER COSTS . . . GREATER PROFITS!

In this day and age of AUTOMATION set-up time is a prime cost factor. Cut your set-up time by as much as 75% with R and L TOOLS.



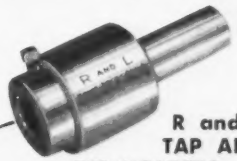


R and L TURNING TOOL . . .

changes in 10 seconds for right or left turning, and replaces an assortment of 14 tools costing more than five times that of one R and L Turning Tool.

R and L KNURLING TOOL . . .

Half the weight . . . twice as efficient as other knurling tools. One hex wrench makes all adjustments.



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New release mechanism makes right or left threading possible . . . an exclusive R and L feature.

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TURNING TOOL • CARBIDE OR ROLLER BACKRESTS • RELEASING OR NON-RELEASING TAP AND DIE HOLDERS, (ALSO FURNISHED FOR ACORN DIES) • UNIVERSAL TOOL POST • CUT-OFF BLADE HOLDER • RECESSING TOOL • REVOLVING STOCK STOP • FLOATING DRILL HOLDER • KNURLING TOOL

Here's a New Time-Saving Tooling Idea!

COMPLETE STOCKS OF DAVIS BLANK-BAR FLYCUTTERS LET YOU TOOL UP FASTER BY MACHINING ANY SHANK OR PILOT STYLE DESIRED RIGHT IN YOUR OWN SHOP

Now at Davis you can choose from 11 different Super Micrometer-Adjustable Flycutter Tools—4 with 18 inches of blank bar on each side of the cutter, and 7 with unfinished shanks—and save a lot of tooling time and money by machining the bar sections to your own requirements.

Cutter adjustments to within 0.0001" are obtained by merely turning the dial of the simple, sturdy Davis micrometer mechanism. Both heavy roughing cuts and fine finishing cuts can be made with these versatile, precision tools.

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Davis Stub Boring Tools with Unfinished Shanks handle a range of bores from 1¼" to 7" diameter. Overall length runs from 12" to 19". Diameter and length of the unfinished portion provide ample stock for machining a shank exactly to fit your particular type and size of vertical boring mill, horizontal boring machine, engine or turret lathe, or radial drilling machine.

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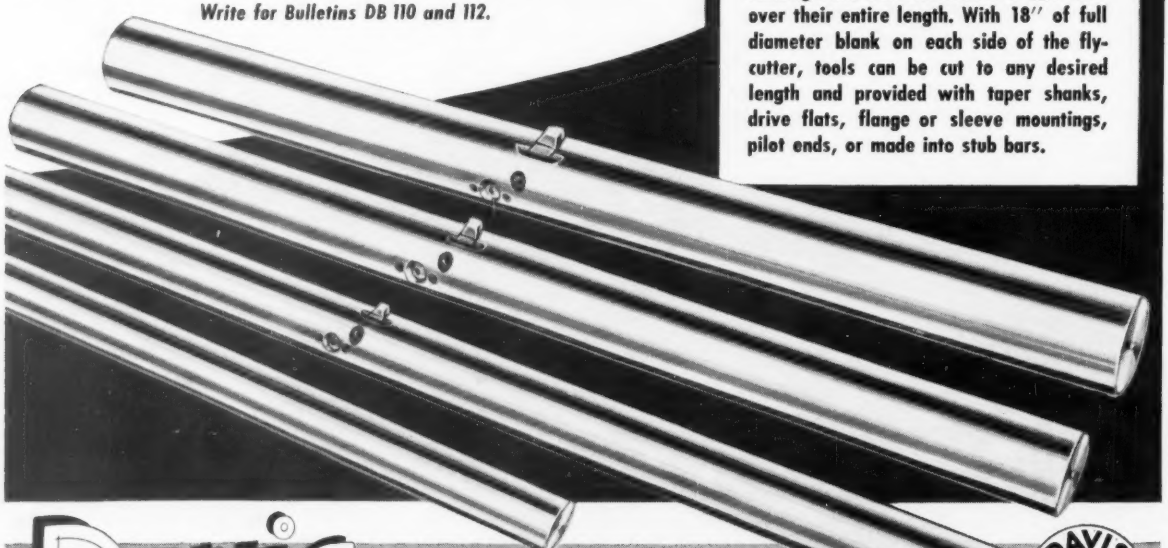
4 DIAMETERS OF 36" LENGTH UNIVERSAL BAR BLANKS

Davis Bar Blanks handle a range of bores from 1½" to 4⅝" diameter. Bars are finish ground with a tolerance of ±0.001" over their entire length. With 18" of full diameter blank on each side of the flycutter, tools can be cut to any desired length and provided with taper shanks, drive flats, flange or sleeve mountings, pilot ends, or made into stub bars.



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Using a new and unique non-contacting tracer control, the Model 104 works direct from simple, large-scale line drawings easily prepared with electrically conductive "ink". The contour of the drawing is reproduced at the milling head at **any reduced** scale, such as 5:1, 10:1, 20:1, or higher. Any errors in the drawing are proportionately reduced, resulting in extreme accuracy of the workpiece. Since neither model nor complex tooling-up is required, production costs are minimized. Built for continuous, heavy-duty operation, the Model 104 provides a wide range of spindle speeds (48 to 11,500 rpm) and ample power to assure efficient milling or grinding of practically any desired metal or alloy.

If you are producing external or internal cams, templates, and blanking punches and dies of irregular, complex shape . . . here are important opportunities for added precision, reduced production time, and cost savings never before possible!

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Horizontal Boring, Drilling & Milling Machine

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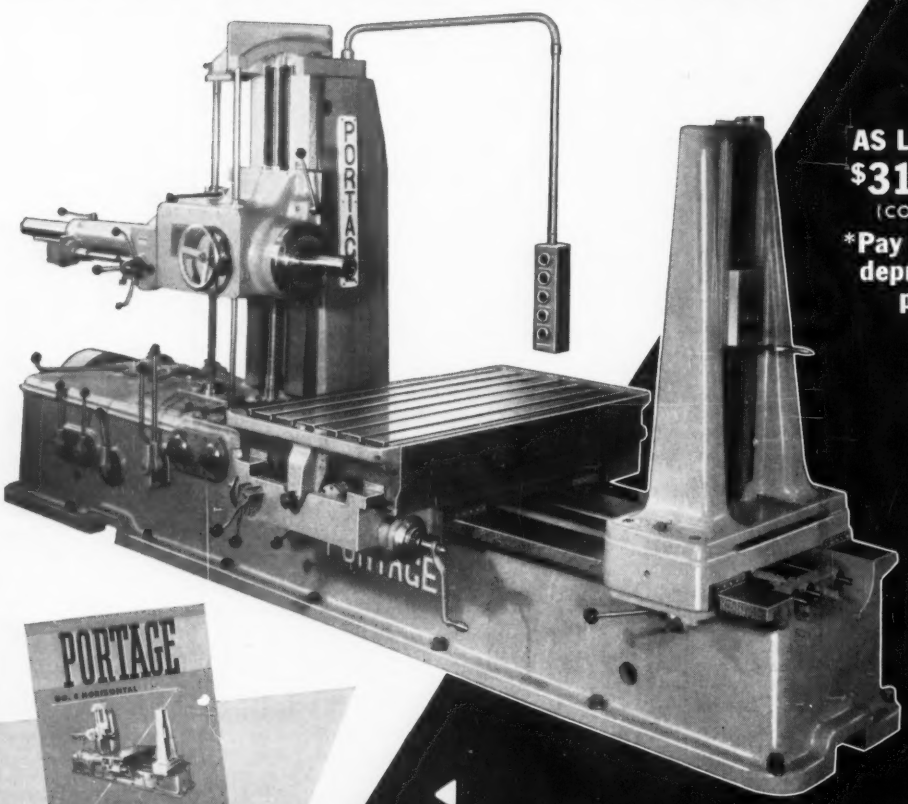

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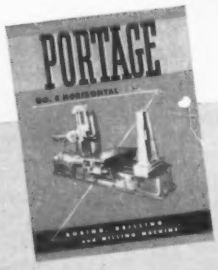

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For more information on products advertised, use Inquiry Card, page 241

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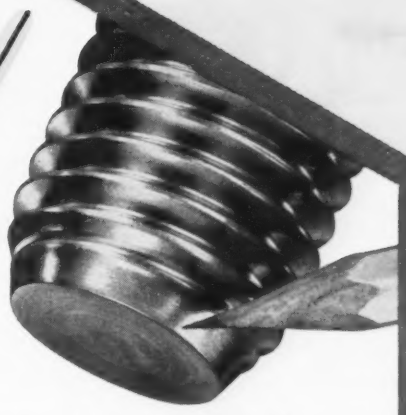
OFFERS YOU

THE LEADER POINT



Allen's unthreaded Leader Point permits easier starting, reduces the possibility of cross threading, protects threads from damage if the screw is accidentally knocked or dropped. Your Allen Distributor stocks the largest range of sizes in 18-8 stainless cap screws available anywhere . . . 97 standard sizes #4 x ¼" to ⅝" x 3" with NC threads; #10 x ⅜" to ⅝" x 1½" with NF. Be sure to specify genuine Allen Leader Points.

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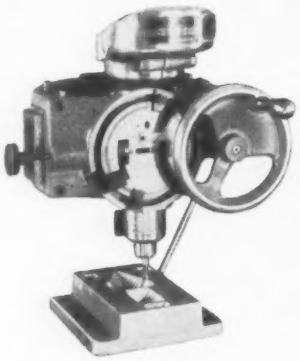
STAINLESS SET SCREWS

With the improved Allenpoint, available from your distributor in 54 standard sizes #4 x ⅛" to ½" x 1" NC and #10 in lengths from 3/16" to ¾" NF.

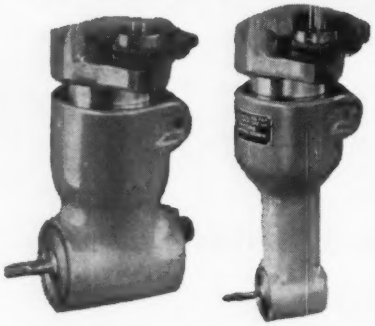
Sold only through leading Industrial Distributors.

RIGHT ANGLE ATTACHMENTS



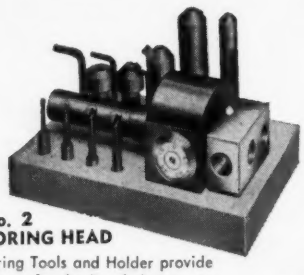
CHERRYING ATTACHMENT

Makes possible production of convex and concave shapes. Ideal for producing drop forge dies, molds, cavities, meetal core boxes etc.



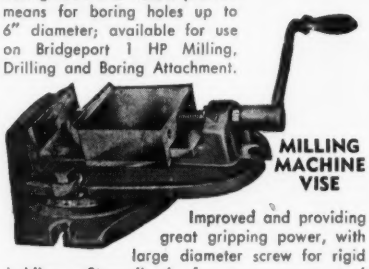
(Left) Heavy Duty . . . for milling and drilling at right angles; fits both Master and 1 HP Bridgeport Heads (Right) Light Duty . . . for right angle milling and drilling narrow, deep molds and cavities.

A few of the Attachments available



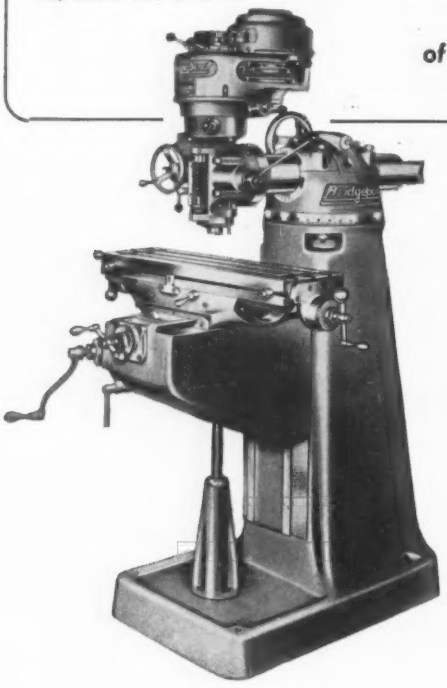
No. 2 BORING HEAD

Boring Tools and Holder provide means for boring holes up to 6" diameter; available for use on Bridgeport 1 HP Milling, Drilling and Boring Attachment.



MILLING MACHINE VISE

Improved and providing great gripping power, with large diameter screw for rigid holding. Streamlined for appearance and equipped with coolant trough. Two sizes: 5"x3½" and 6"x5" jaw openings.



Bridgeport

TURRET MILLING MACHINE'S ATTACHMENTS

add unprecedented versatility in productive ability

"Bridgeport Millers" in themselves are universally recognized as machines of outstanding utility. Their *exclusive method* of being able to drill, mill, bore and shape over a wide area without changing set up, has contributed much to their universal acceptance through the convenience, economy and accuracy offered. But this is not the whole story . . .

Note the attachments shown above. Here are a few means developed by "Bridgeport" engineers to go still further in extending the versatility of these machines . . . attachments which mean not only greater convenience but which vastly extend the operations which can be performed . . . attachments which will enable *one* machine to do the work of *several* single purpose machines. Furthermore, many more jobs can be assigned to the "Bridgeport" with the result that many more productive hours are available from *one* machine.

Ask your dealer . . . or us . . . to show how you, too, can apply Bridgeport Attachments to extend the utility of your machines. Ask also for literature on Bridgeport Turret Milling Machines.

Bridgeport MACHINES, INC.

Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines

For more information on products advertised, use Inquiry Card, page 241

New M-R-C SUPER-PRECISION *Instrument Ball Bearing* CATALOG

Write for Form 1543

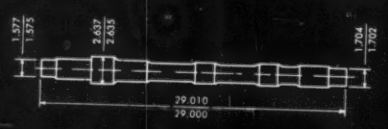
MARLIN-ROCKWELL CORPORATION

Executive Offices: **Jamestown, N.Y.**

SUGGESTION BOX

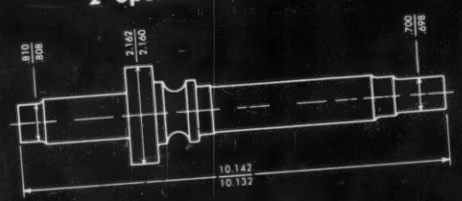
Check MONA-MATIC TURNING FOR YOUR JOB

MONA-MATIC METHOD
2 operations, 11 1/4 min.



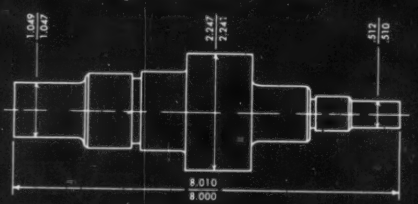
OLD METHOD
10 operations, 81 1/2 min.

MONA-MATIC METHOD
2 operations, 6 3/4 min.



OLD METHOD
11 operations, 27 3/4 min.

MONA-MATIC METHOD
2 operations, 4 min.



OLD METHOD
12 operations, 22 1/4 min.

MEMO

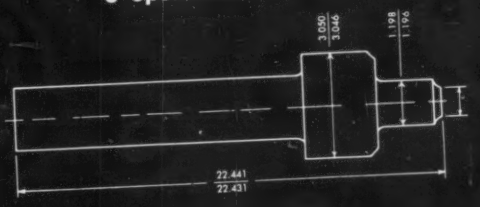
All parts are AMS 6260 forgings. Because they are partially restricted, they cannot be identified by name. In every case, a limit of ± .001″ is held on all diameters and dual template control employed. In addition to the tremendous reduction in time, *setup time has been reduced to a marked degree* and *tool costs are much lower*. A further advantage of the Mona-Matic method is the fact that *many grinding operations, heretofore necessary, have been eliminated*. While these 5 examples of time saving are extraordinary, it is a matter of record that the time saving on 22 other jobs, run over the same machines, ranges from 50 to 70%.

Want the facts on Mona-Matic turning? High time! Send the coupon for illustrated brochure with complete data, specs., and job reports. The Monarch Machine Tool Company, Sidney, Ohio

SAF
FIRS

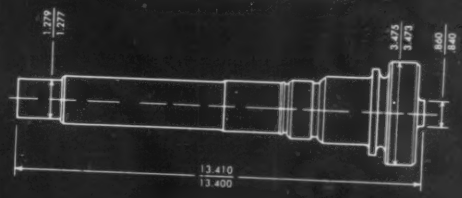
BULLETIN BOARD

MONA-MATIC METHOD
3 operations, 12 min.



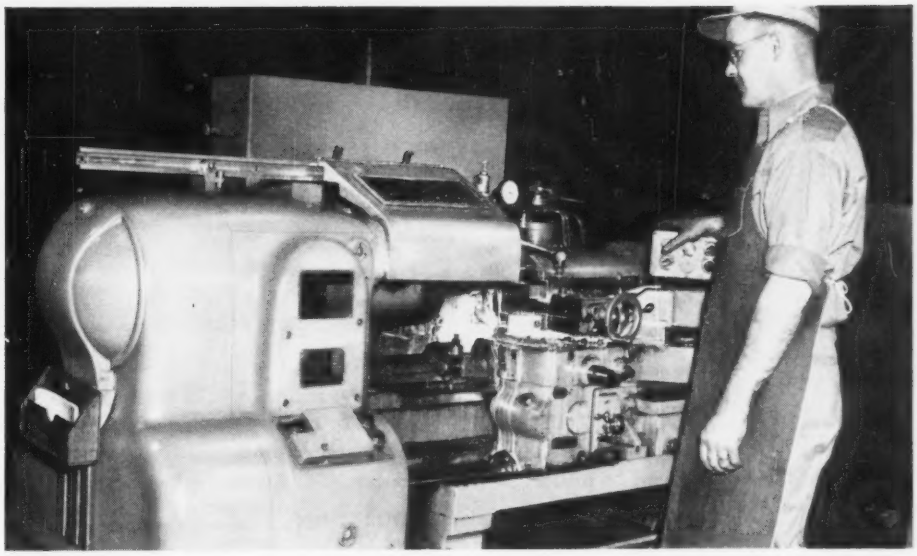
OLD METHOD
11 operations, 63½ min.

MONA-MATIC METHOD
2 operations, 8 min.



OLD METHOD
12 operations, 41 min.

TURNING NEWS



THE MONARCH MONA-MATIC

Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

THE MONARCH MACHINE TOOL CO., Sidney, Ohio

Gentlemen: I am interested in your Mona-Matic story and would like to receive your illustrated Booklet, with complete data and job performance reports. Please send me your Booklet 1805.

NAME_____ TITLE_____

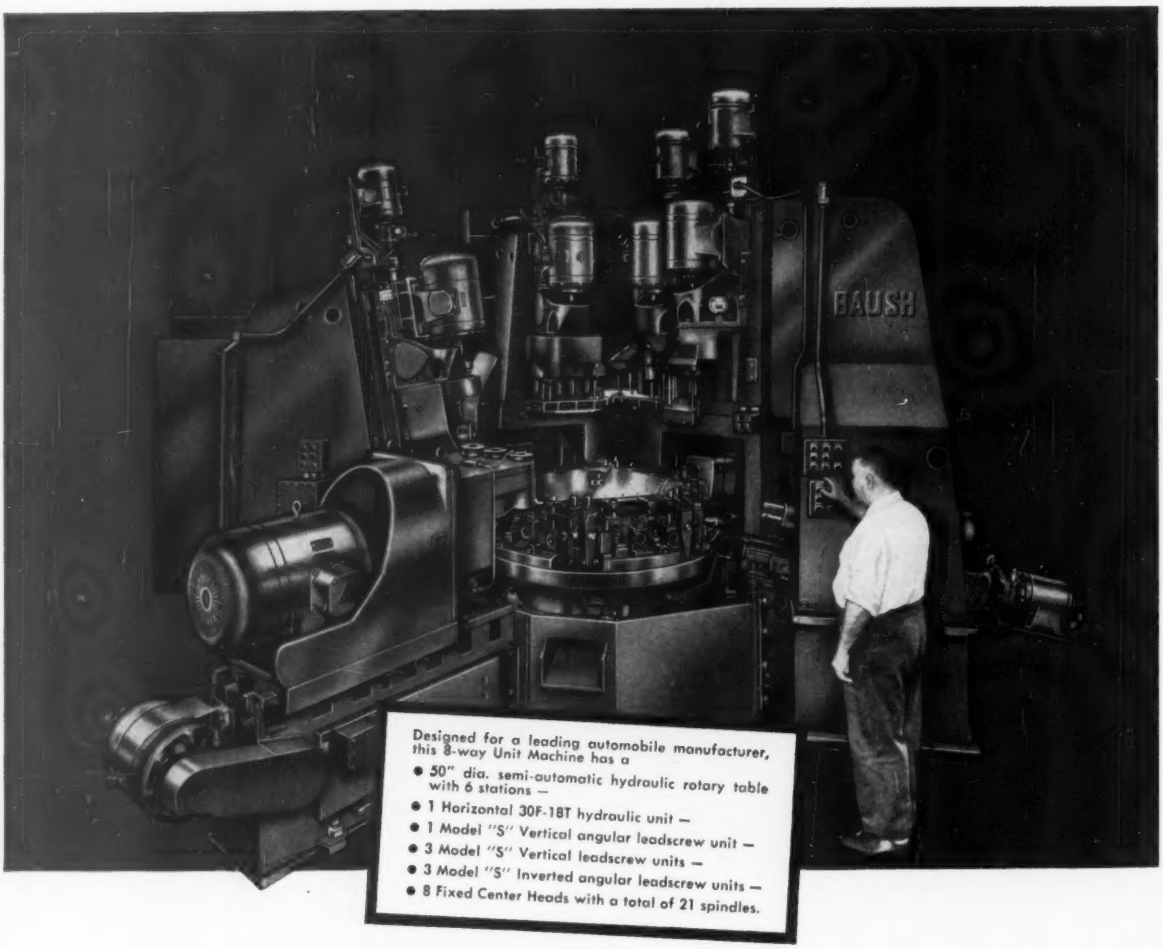
COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

100 EXHAUST MANIFOLDS EVERY HOUR

with this 8-Way Unit Machine with Rotary Table



Designed for a leading automobile manufacturer, this 8-way Unit Machine has a

- 50" dia. semi-automatic hydraulic rotary table with 6 stations —
- 1 Horizontal 30F-18T hydraulic unit —
- 1 Model "S" Vertical angular leadscrew unit —
- 3 Model "S" Vertical leadscrew units —
- 3 Model "S" Inverted angular leadscrew units —
- 8 Fixed Center Heads with a total of 21 spindles.

It is this kind of trouble-free, accurate production that has been the background of BAUSH machine tools. You can't do better than rely on Baush — why not let our engineers work with you on your machining problems?

BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

OPERATIONS: Mill mounting pads and exhaust pad — drill, coredrill, chamfer, ream and tap.

PRODUCTION: 100 exhaust manifolds per hour at 100% efficiency.

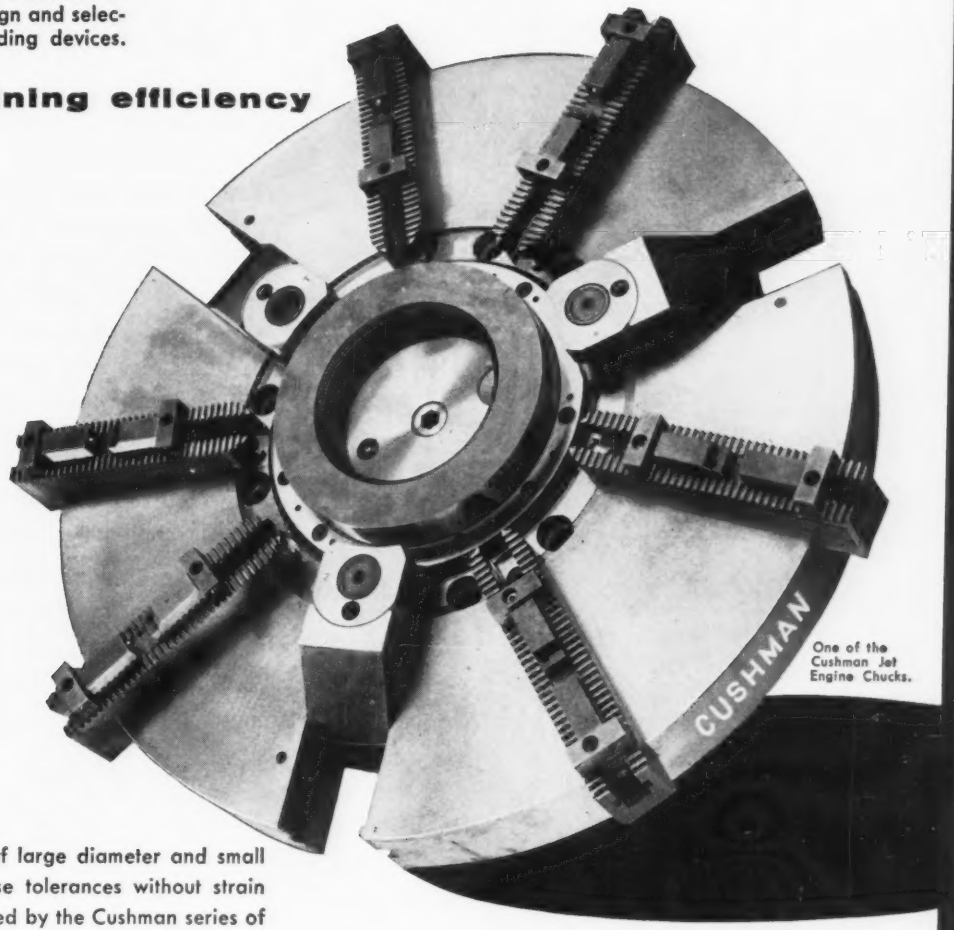
FIXTURE: Part sets into holding units in temporary location, and is hydraulically equalized, located and clamped from contours of bolt flange bosses. Hydraulically locked spring plungers give required support to offset tool thrusts. Hydraulic functions are controlled by hand valve at each station. Relief valves in operational cylinder supply line control sequence. All drilling and reaming stations have bushing plates that rest and register on holding units and slide on bars extending from heads. Hydraulic fluid power supplied from centrally located high pressure swivel. Chips shed towards outside of setup.

For more information on products advertised, use Inquiry Card, page 241

CUSHMAN chucks give Chuck-ability

CHUCK-ABILITY — The ability to SPEED your work . . . ELIMINATE fatigue . . . IMPROVE your products . . . and REDUCE your costs . . . through design and selection of the right work-holding devices.

the key to machining efficiency



One of the Cushman Jet Engine Chucks.

Efficient machining of jet engine parts of large diameter and small cross-section to extremely close tolerances without strain or distortion was materially improved by the Cushman series of special chucks designed and built for this purpose. These chucks completely overcome the inherent difficulties of the operations and permit mass production of these vital component parts. The success of these new chucks is one more proof that Cushman gives **Chuck-ability** as an essential to efficient production.

Manufacturers throughout the country have long recognized and used the Cushman Engineering Department for solutions to chucking problems. We invite you to use this experienced service.

THE CUSHMAN CHUCK COMPANY
Hartford 2, Connecticut
a world standard for precision

CUSHMAN the CHUCKMAN CHUCKS AND ACCESSORIES Exclusively 1862

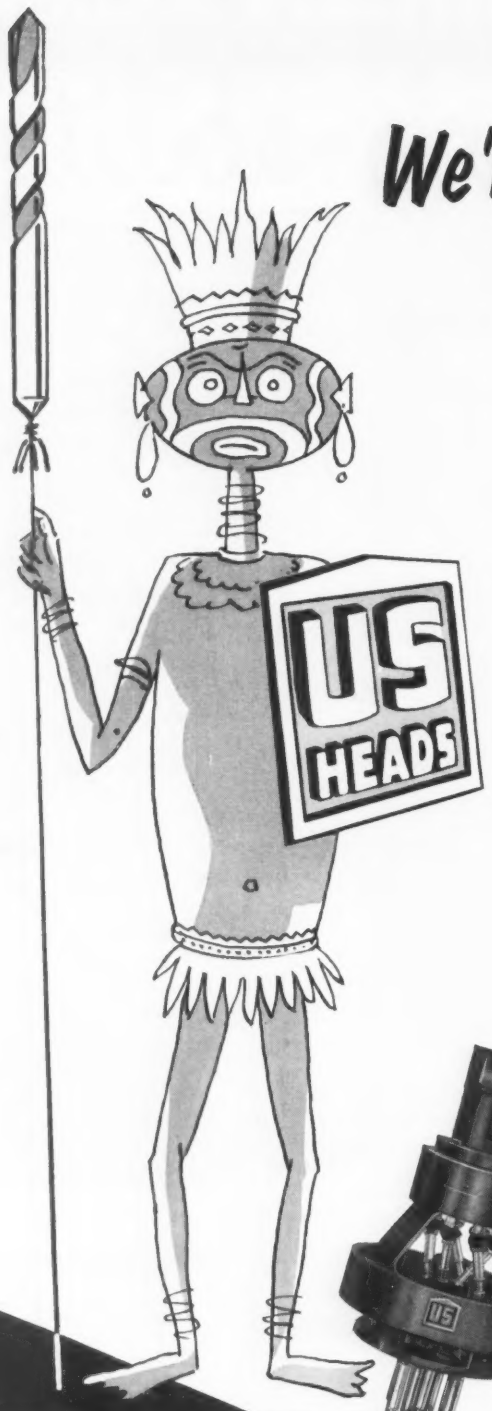
SEE YOUR INDUSTRIAL DISTRIBUTOR

manufacturers of:

Air Operated Chucks, Cylinders, and Accessory Equipment . . . The Cushman Power Wrench . . . Cushman Manually Operated Chucks and Face Plate Jaws.

Visit us at Booth No. 1079
ASTE Western Industrial Exposition

We're Looking for Head Hunters!....



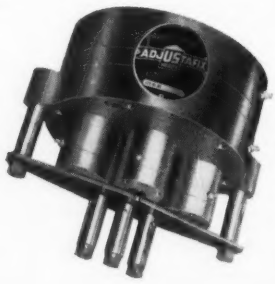
Most machine tool men have long relied upon the "US" Adjustable Multiple Spindle Drill Heads. But we are looking for those who still haven't tried them . . . and who are looking for the best.

With their quick-change universal joint assemblies, they are built for continuous use, with full anti-friction bearing construction for high capacity thrust loads. The universal joint adjustable multiple spindle type is suitable for any sensitive drilling machine. Joints are self-lubricating. All gears are hardened and shaved with spindles superfinished.

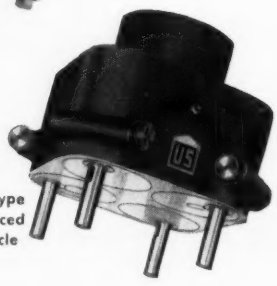
The single eccentric type is used for equally spaced holes on bolt circles.

The new double eccentric AdjUStafix, two to eight spindles, permits spindles to be located in non-symmetrical patterns. It eliminates expensive change in set-up.

Universal joint with slip spindle fixed locating plate



Double eccentric type for irregular spacing



Single eccentric type for equally spaced holes on bolt circle

Write for details on any type of universal joint adjustable head. Ask also about our totally enclosed gear-driven adjustable, fixed center, or individual lead screw tapping heads.

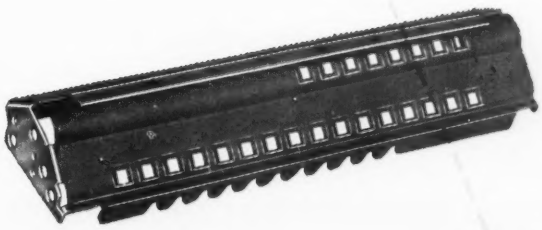
UNITED STATES DRILL HEAD COMPANY

616-618 BURNS STREET • CINCINNATI 4, OHIO

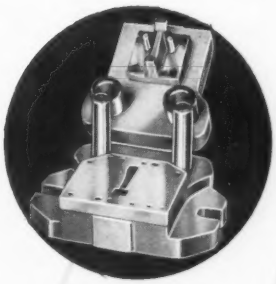
For more information on products advertised, use Inquiry Card, page 241

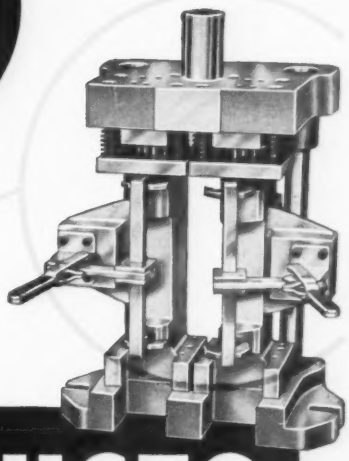
PRODUCTO *Catalog* DIE SETS

SOLVE SPECIAL STAMPING PROBLEM FOR MONROE



The Problem:
Stamping end-plate holes in the carriage cover of the Monroe Adding Calculator.

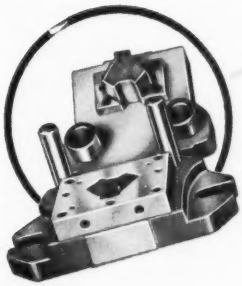


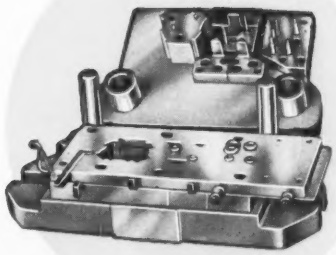


PRECISION

PRODUCTO

New design





THE DIE MANUFACTURER:
The Connecticut Tool and Engineering Co., Bridgeport, Conn.

The lofty die, at right, represents the last critical stamping operation in the production of the Monroe carriage cover, shown above. It's unusual because it pierces close-tolerance end holes in either 10″ or 12″ covers *after* they have been assembled. The die set that controls this precise piercing operation both looks and performs like a "special" made-to-order set. Actually, it is a rear pin catalog set fitted with 1¼″ x 16″ pins. Even with the long guide pins, the highly accurate parallelism is maintained. Yes, Monroe is getting the benefit of a "special" without paying for extras in time and expense.

In all, 12 Producto catalog die sets are used in stamping and forming this assembly. Only the one with the long guide pins is unusual in size or shape but *all* require the utmost in precision and dependability. The point to remember is this: Whether you require a "made-to-order" special or a "quick-to-order" catalog die set, you'll get the *best* from Producto.

FOR PRECISION DIE SETS *FAST* CALL...

THE PRODUCTO MACHINE COMPANY • 985 Housatonic Ave., Bridgeport 1, Conn.

ALSO MAKERS OF DIE ACCESSORIES, FEEDING EQUIPMENT, VISES, MACHINERY. 2PD54A

For more information on products advertised, use Inquiry Card, page 241

New BAKER Automatic MACHINES 15,000 lb. TANK HULL as it passes along 100 FOOT RAILS!

OPERATIONS: DRILLING . . . TAPPING . . . BORING . . . FACING on 102 holes . . . plus 10 main bores. Mounted on a specially-built floating concrete slab, this huge new Automatic Baker Transfer Machine accurately performs multiple drilling, tapping, boring and facing operations on 15,000 pound rough weldments 9 feet wide and 16 feet long. Savings achieved in production costs with a machine of this type are tremendous. Baker engineering know-how stands ready to solve your production problems . . . with cost cutting standard or special, single or multi-operation machines.

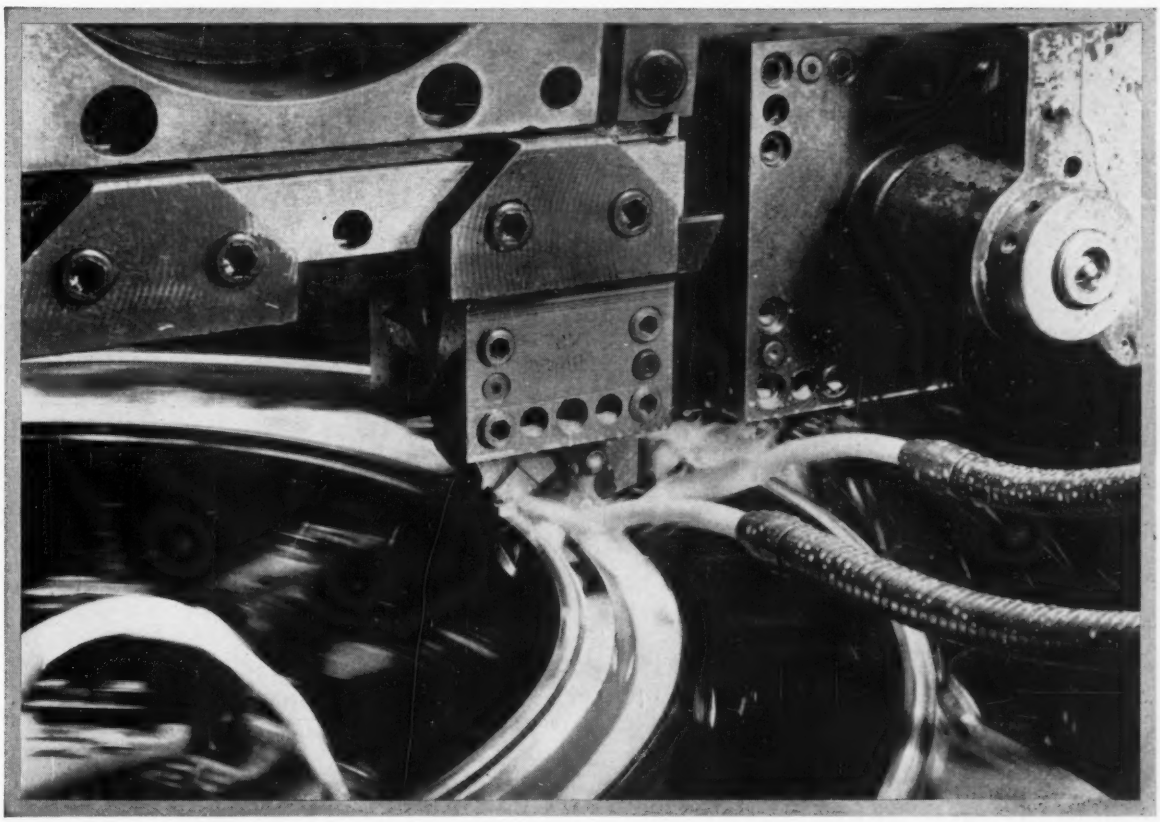
Write regarding your specific job problems . . .

BAKER BROTHERS, INC. Toledo, Ohio
DRILLING . . . TAPPING . . . KEYSEATING and CONTOUR GRINDING MACHINES

For more information on products advertised, use Inquiry Card, page 241

Industry-wide records
prove that . . . as compared with other
steel-cutting carbides . . .

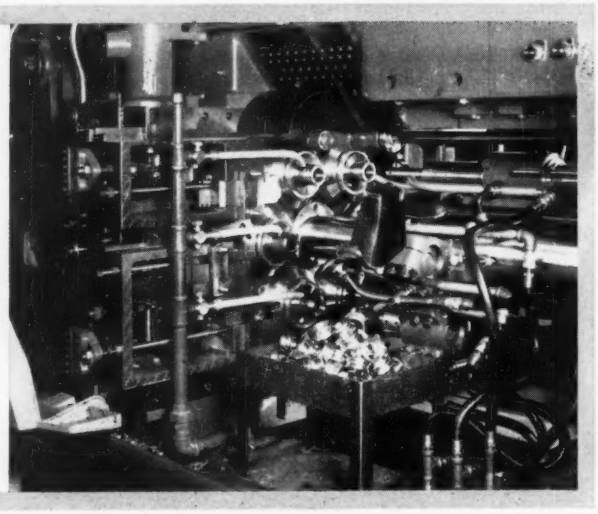
Carboloy® Grades 350, 370 carbides increase production as much as 3⅔ times



BEFORE CARBOLOY GRADE 370, 17 other carbides were tried by the Jet Division, Thompson Products, Inc., for facing 310 stainless-steel jet-engine compressor frames. The best any carbide could do was 3 pieces per 8-hour shift. With Grade 370, production jumped to 14 pieces. Tool life was doubled; tool inventory was lowered. Downtime losses were cut because Grade 370 inserts machined almost 3 times as many pieces per grind.

SETUP: Material—310 Stainless steel. **Speed**—340 SFPM. **Feed**—0.008 inch. **Depth of cut**—0.100 inch at 36 rpm. **Coolant**—Yes.

For other reports of new production and efficiency records set with Series 300 carbides, see the following pages.

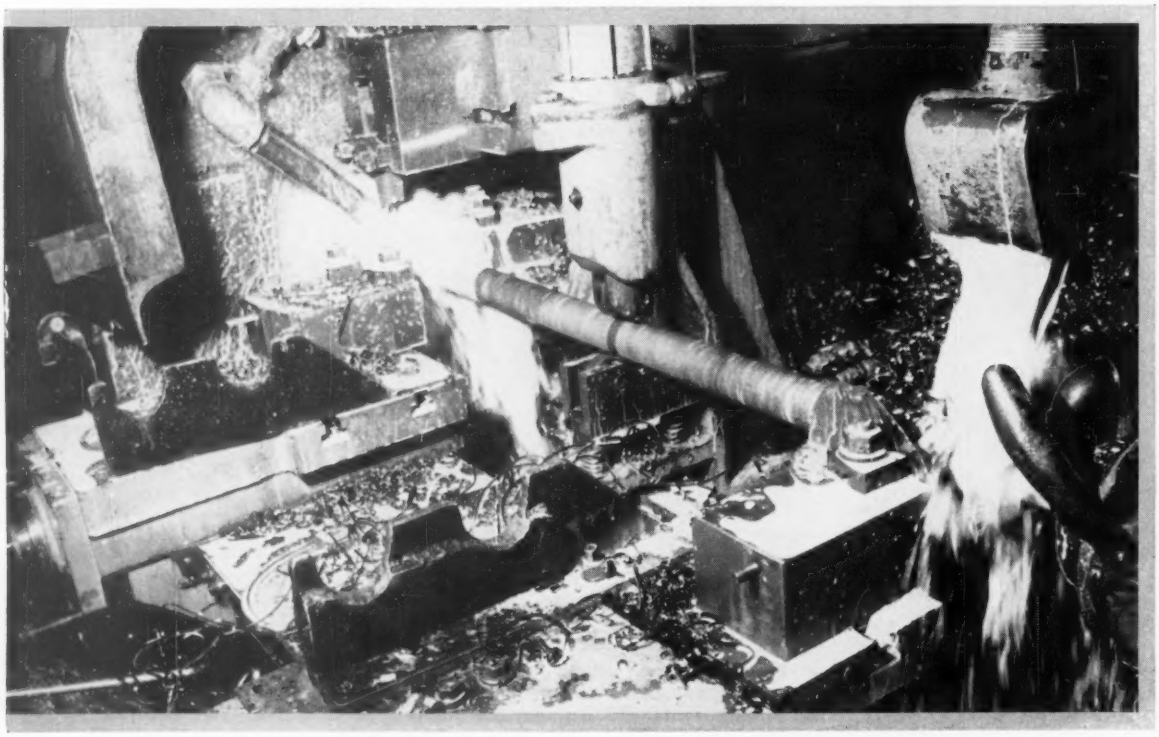


PRODUCTION TIME WAS CUT IN HALF when Grade 370-equipped tools were installed in this Cone 6-spindle bar automatic. Seven Grade 370 tools did the job of fourteen high-speed steel tools for machining inner bearing races.

SETUP: Material—SAE 52100 steel tubing. **Speed**—333 SFPM. **Coolant**—Yes.

Case-history proof of how . . .

New Carboloy Steel-cutting

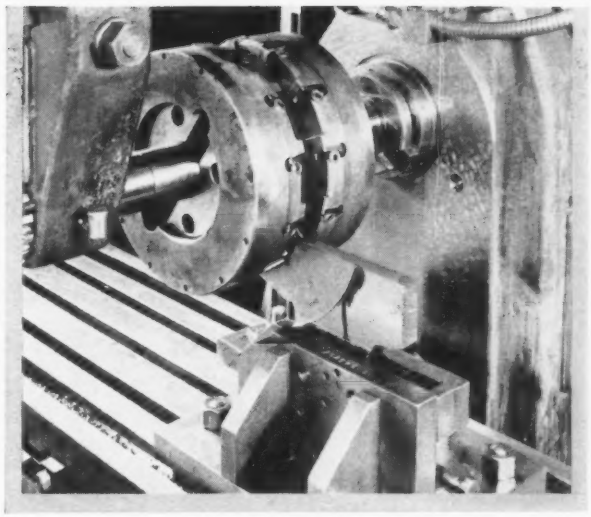


PRODUCTION WAS INCREASED more than 33% when Carboloy Grade 350 tools were used to turn this AISI 4150 48″ truck axle forging. Grade 350 machines front and back ends simultaneously; eliminates chipping and flaking encountered with other carbides.

SETUP: Material—AISI 4150 steel forging. **Speeds**—200 SFPM on 2-inch dia.; 400 SFPM on 4-inch dia. **Feeds**—0.014 inch. **Depth of cut**—1/16 to 1/8 inch. **Coolant**—Yes.

SWITCHING TO GRADE 370 inserts, for straddle milling this forging, enabled Robert H. Brooks Co. to go from almost no production to completely satisfactory production. Grade 370 held tolerances to the required thousandths on this jet fighter wing fitting; produced so fine a finish that it is impossible to determine the blend line after plating.

SETUP: Material—SAE 4140 forging, heat-treated between 40 to 43 Rockwell C. **Speed**—650 SFPM. **Feed**—0.0025 inch per tooth. **Depths**—0.062 inch and 0.083 inch. **Coolant**—Yes.



Grades outcut, outlast all other carbides

Here's why Series 300 carbides will immediately bring you increased production and greater operating efficiency:

1. Grades 350 and 370 have been designed for you to get the most out of your machine tools. They can operate without tip deformation at higher speeds and faster feeds than other carbides. This built-in production ability lets you take full advantage of your equipment.
2. Grades 350 and 370, proved by in-plant records, give more production per grind, more grinds per tool, more production per shift. In short, in hundreds of operations similar to those on these pages, they have outperformed other carbides in every respect.

Carboloy Series 300 carbides are made by a new carefully controlled process. This process gives Series 300 a built-in structural rigidity, which enables them to operate at temperatures as high as 1800° F. . . temperatures that cause cutting-edge deformation in other carbides.

You can get Carboloy cutting tools, boring tools, inserts and blanks of Grades 350 and 370 in a wide range of styles and sizes. Your Authorized Carboloy Distributor can fill your orders immediately. For the new Series 300 price list GT-305, send coupon on the next page, today.

Carboloy Created-Metals for Industrial Progress

Your Authorized Carboloy Distributor
can meet your steel-cutting needs from his . . .

New, enlarged line of Series 300 tools and blanks

With the addition of 117 new sizes of standard tools and blanks, your local Authorized Carboloy Distributor can now give you immediate delivery on practically every Grade 350 and 370 tool and blank you need. Many other sizes and styles are available nonstock from the Carboloy plant in Detroit.

Carbides for cutting all materials

In addition to the Series 300 carbides, complete stocks of Carboloy tools and blanks are available in various grades, for machining all materials—ferrous or nonferrous, metallic or nonmetallic.

The following standard-grade items have also been recently added to the standard line:

- 20 sizes of Grades 883 and 44A style 0000 blanks for heavy-duty cast-iron and nonferrous cutting.
- Throwaway-type blanks.
- Grade 883 style F and G offset turning tools in $\frac{1}{2}$ and $\frac{5}{8}$ inch sizes.
- Offset threading tools.

For price lists and specifications on Series 300 carbides and standard grades, send coupon today.

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

MANUFACTURERS OF CEMENTED CARBIDES, PERMANENT MAGNETS, THERMISTORS, HEVIMET, AND VACUUM-MELTED METALS

CARBOLOY
Department of General Electric Company
11147 E. 8 Mile Ave., Detroit 32, Michigan

☐ Send Brief-a-Log GT-305, containing price list and specifications on Grades 350 and 370.

☐ Send Brief-a-Log GT-285, containing price list and specifications on standard grades.

Name_____ Title_____
Company_____
Address_____
City_____ Zone____ State_____

See the Yellow Pages

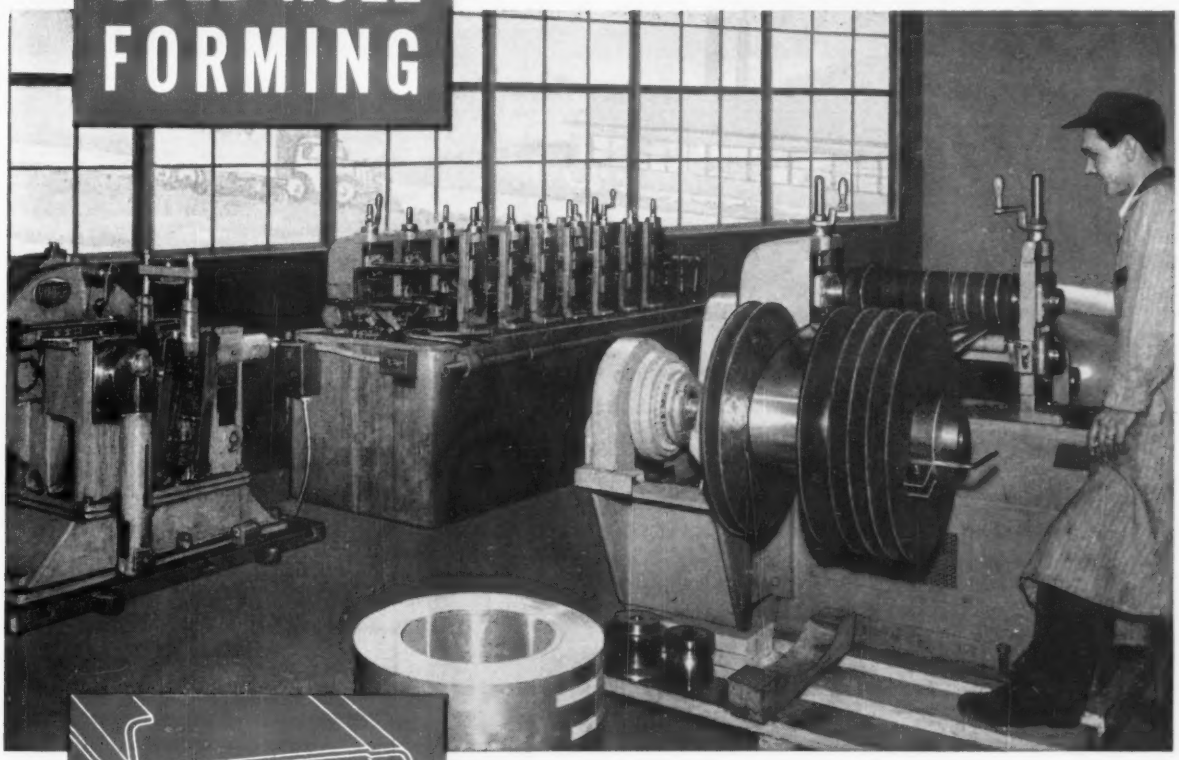
. . . for the name of your local Authorized Carboloy Distributor. You'll find his name under the Carboloy trademark listing in classifications: TOOLS or TOOLMAKERS.

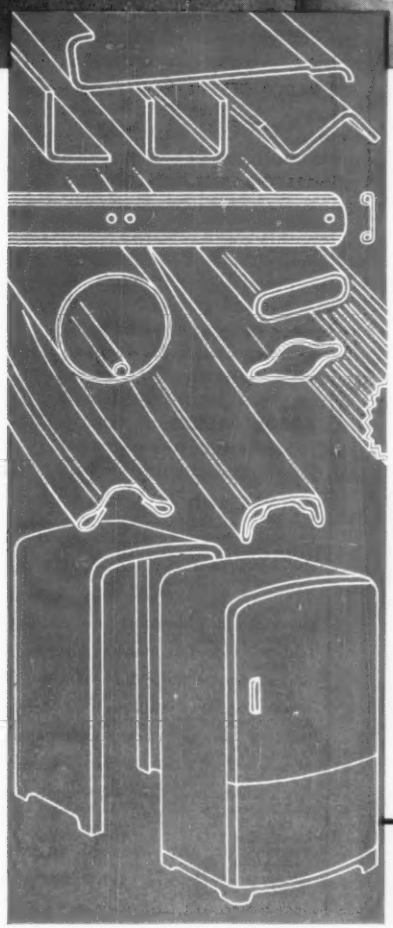
Visit Carboloy Booth 456
at the
ASTE Western Industrial Exposition
Los Angeles, March 14-18

For more information on products advertised, use Inquiry Card, page 241

COLD-ROLL FORMING

Yoder Cold Roll Forming Machine with Shear Type Automatic Cut-Off and Small Slitting Line installed by Wolverine Mouldings, Inc., Lincoln Park, Mich.





for the Growing Business

● As your business grows, new opportunities arise for drastic cost reduction through the use of cold roll formed parts or finished products.

Decorative metal mouldings is only one of a great many things you can make with a Yoder cold-roll forming machine.

For instance, you can economically make structural angles, channels, etc., up to ½ in. thick. You can form wide sheets or panels into cabinets or shells for refrigerators, ironers, lockers, radio and TV sets, etc. You can make virtually all the components for metal buildings, including trusses, joists, studs, siding, roofing, windows, and doors.

Edges of shapes can be folded in and over to make interlocking joints for cabinets, rolling doors, box and tubular products.

You can, in addition to longitudinal forming, do perforating, notching, embossing, coiling, curving, welding, etc. Sections can be cut to length and ends given almost any shape, plain or fancy, by means of one or two Yoder automatic cut-off machines synchronized with the forming speed.

The Yoder Book on Cold-Roll Forming is an illustrated treatise on the art, the machines and many of the things they can do to reduce cost and increase production. A copy is yours for the asking. Consultations and estimates without cost or obligation.

THE YODER COMPANY • 5504 Walworth Ave., Cleveland 2, Ohio

Complete Production Lines

★ COLD-ROLL-FORMING and auxiliary machinery
★ GANG SLITTING LINES for Coils and Sheets
★ PIPE and TUBE MILLS — cold forming and welding

ENGINEERING YODER MANUFACTURING

Product Directory

To find headings easily, look for capital letters at top of each page to denote locations.

ABRASIVE CLOTH, Paper and Belt
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

ABRASIVES
See Discs, Abrasive

ABRASIVES, HONING
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.

ABRASIVES, Polishing, Tumbling, Etc.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.

ACCUMULATORS, Hydraulic
American Steel Foundries, Elmes Engineering Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Dv., Phladelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Farrel-Birmingham Co., Inc., 25 Maln St., Ansonia, Conn.
Hydro-Line Mfg. Co., 5764 Pike Rd., Rockford, Ill.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

AIR HOISTS—See Hoists, Air.

AIR TOOLS—See Grinders, Pneumatic; Drills, Portable Pneumatic, Etc.

For screw machine production your best metal-cutting saws

are

CIRCLE R

As specialists, we make nothing but circular metal-cutting tools. And we make nothing but the best you can buy, though they cost no more. Specify HSS—or in automatic production get the economy of longer runs, less down time, precision performance with Circle R tools of Circoloy, solid tungsten carbide, or carbide tipped as the job indicates. Standardize with Circle R screw slotting saws (including W.F. Type), jewelers' slotting saws, cut-off saws, commutator slotting cutters, combination center drills, etc.

Consult CIRCLE R *Specialists in:*

BURBANK, CHICAGO, CLEVELAND, DAYTON, DETROIT, INDIANAPOLIS, KANSAS CITY, MILWAUKEE, NEW YORK CITY, PHILADELPHIA, MONTREAL, PHOENIX, PITTSBURGH, PROVIDENCE, ROCHESTER, ST. LOUIS

SUPREME QUALITY R 1923 - 1955

CIRCULAR TOOL CO., INC.

PROVIDENCE 5, RHODE ISLAND

Specialists in Circular Cutting Tools Since 1923

METAL SLITTING SAWS
COPPER SLITTING SAWS
SCREW SLOTTING SAWS
COMMUTATOR SLOTTING SAWS
JEWELERS' SLOTTING SAWS
CUT OFF SAWS • CIRCULAR KNIVES & ROTARY SHEAR BLADES • CIRCOLOY STEEL SAWS • SOLID & TIPPED TUNGSTEN CARBIDE SAWS
COMBINED DRILLS & COUNTERSINKS • CENTER REAMERS

ALLOY STEELS
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., Carnegie-Illinois Steel Corp. Div., 436 7th Ave., Pittsburgh, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

ALLOY STEELS, High Temperature
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

ALLOYS, Non-Ferrous
American Brass Co., 25 Broadway, New York.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Mueller Brass Co., Port Huron 35, Mich.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

ALLOYS, Zinc
New Jersey Zinc Co., 160 Front St., New York, N. Y.

ARBOR PRESSES
See Presses, Arbor

ARBORS AND MANDRELS
Brown & Sharpe Mfg. Co., Providence, R. I.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chcago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Gorton, George Mch. Co., 1110 W. 13th St., Racine, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Keo Cutters, 19326 Woodward, Detroit, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

(*Continued on page* 278)

DON'T BE A SHEEP WHEN BUYING GAGES!

You can go far astray following a "FAD"

It's fashionable today to buy costly, complicated gages for even simple gaging requirements. Sure, we like to sell expensive gages, but we don't think it's good business to sell such gages when simple gages will do. Perhaps an Indicator Gage does require a little operator care but it's still the most economical when a few instructions are given on its proper care and use. And after all, its accuracy is entirely adequate for most applications.

Consider a few of the advantages of using Indicator Gages where these will perform the job: Each gage is a complete package — there are no extra appurtenances to buy and maintain. No wires and hoses to drag and tangle. No accessories to lose, no airlines to keep clean. It is simple to operate, simple to maintain. Its purchase price is low, as is also its maintenance cost. In addition, the greater range per unit, and its greater flexibility, permit an Indicator Gage to perform far more operations than an excessively accurate and complicated gage so fashionable right now.

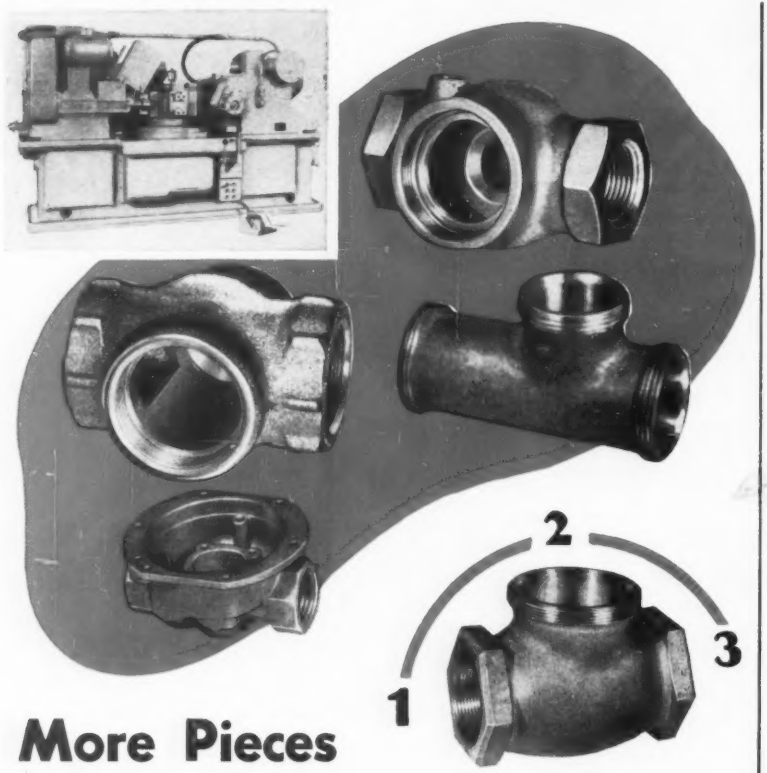
Ask for our complete catalog.

Federal Products Corporation
5112 Eddy Street, Providence 1, R. I.

Ask **FEDERAL**

FOR ANYTHING IN MODERN GAGES...

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automatically Controlling Dimensions on Machines



More Pieces COMPLETELY *finished in less time on* GOSS & DeLEEUW AUTOMATIC CHUCKERS

This machine . . . already acknowledged and accepted as a metal-working achievement, and the only standard one of its kind . . . winds up a day's operation with all parts assigned to it completely finished and with no secondary operations necessary. When fully loaded, a complete piece is finished at each index cycle. High productivity is attained with simple tooling.

The "1-2-3" exclusive Goss & De Leeuw feature provides for finish machining three ends of a part simultaneously or in sequence. All operations are performed in a single set-up, and complete finishing done in much shorter time than by conventional methods.

Send for illustrated literature which fully describes this recent Goss & De Leeuw development in chuckers. Submit samples of your work for time and cost estimates.

GOSS & DeLEEUW
QUALITY SPEED PRODUCT-QUANTITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

BABBITT
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.
Ryerson, Jos. T., & Son, 2558 W. 16th St., Chicago 18, Ill.

BALANCING EQUIPMENT
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Cosa Corp., 405 Lexington Ave., New York 17.
Gisholt Machine Co. (Static and Dynamic), 1245 E. Washington Ave., Madison 10, Wis.
Keller Tool Co., Grand Haven, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Olsen, Tinius, Testing Machine Co., Philadelphia, Pa.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Pope Machinery Corp., Haverhill, Mass.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mich. Tool Co., 2531 11th St., Rockford, Ill.

BALL BEARING TESTERS
Micrometrical Mfg. Co., 321 S. Main St., Ann Arbor, Mich.

BALLS
Kennametal, Inc., Latrobe, Pa.

BARS, Phosphor Bronze
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.

BARS, Steel
Allegheny Ludlum Steel Corp., Bethlehem, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of Amerca, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

BASES, Machinery Welded
Mahon, R. C., Co., 6565 E. 8 Mile Rd., Detroit 34, Mich.

BEARINGS, Babbitt
Bunting Brass & Bronze Co., Spencer and Carlton Ave., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.
Link-Belt Co., 2410 W. 18th St., Chicago 8, Ill.

BEARINGS, Ball
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Fafnir Bearing Co., New Britain, Conn.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
New Departure Div., General Motors, Bristol, Conn.
Nice Ball Bearing Co., Ncetown, Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.

BEARINGS, Bronze and Special Alloy
Bunting Brass & Bronze Co., Spencer & Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Johnson Bronze Co., New Castle, Pa.
Link-Belt Co., 2410 W. 18th St., Chicago 8, Ill.

(*Continued on page* 280)

For more information on products advertised, use Inquiry Card, page 241

spot the champ

... and with high speed steels the champion's always REX

Compare the freckles and you'll pick the champ. And it's easy to spot the champ in high speed steels, too, for Crucible REX® has been the *standard of comparison* for over half a century.

Prove the reasons for REX's superiority in your own shop. You'll like its hardenability... response to heat treatment ... fine tool performance. Like thousands of other users, you'll agree *you can't find a high speed steel to outperform REX.*

Ask for REX, a *prescription-made* Crucible product, at Crucible warehouses or leading distributors from coast to coast. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 30, Pa.*

CRUCIBLE first name in special purpose steels

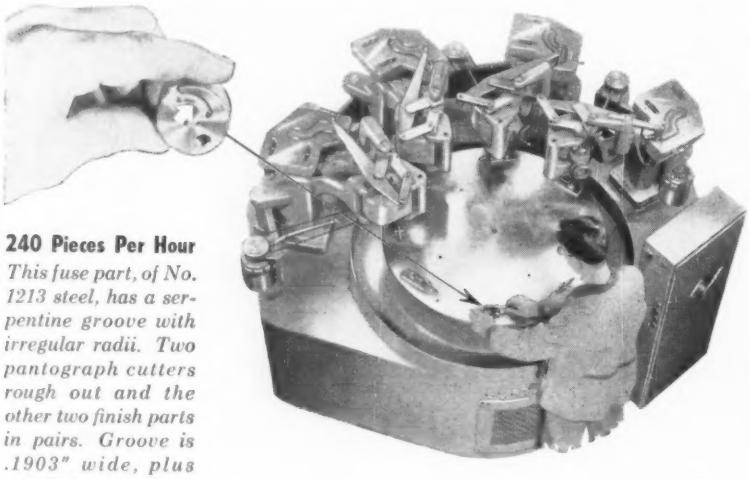
Crucible Steel Company of America

High Production

with GORTON MULTIPLE-SPINDLE INDEXING PANTOGRAPHS

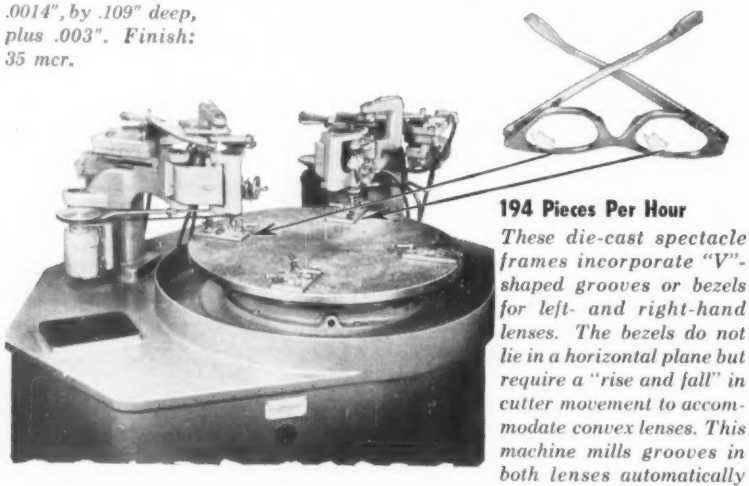
Multiple operations with exceptional repetitive accuracy give you production-line performance on Gorton Multiple-Spindle Indexing Pantographs. From two to six different operations, performed at one setting, result in both precision and economy. Automatic cycling during engraving, milling, profiling, chamfering, counterboring, grooving or routing.

Infinitely variable feeds up to the capacity of any existing cutter. Reversing drive for conventional or climb milling.



240 Pieces Per Hour

This fuse part, of No. 1213 steel, has a serpentine groove with irregular radii. Two pantograph cutters rough out and the other two finish parts in pairs. Groove is .1903" wide, plus .0014", by .109" deep, plus .003". Finish: 35 mcr.



194 Pieces Per Hour

These die-cast spectacle frames incorporate "V"-shaped grooves or bezels for left- and right-hand lenses. The bezels do not lie in a horizontal plane but require a "rise and fall" in cutter movement to accommodate convex lenses. This machine mills grooves in both lenses automatically during the cutting cycle.

These machines are custom-built according to customers' specific requirements. With tooling changes, they have many different applications. Write for Forms 2595-DS1302 and 2604-DS1302 on Gorton Multiple-Spindle Indexing Pantographs.

GEORGE GORTON MACHINE CO., 1302 Racine St., Racine, Wis., U.S.A.

BEARINGS, Lineshaft
Fafnir Bearing Co., New Britain, Conn.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Orange Roller Bearing Co., Inc., Orange, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

BEARINGS, Needle
Orange Roller Bearing Co., Inc., Orange, N. J.

BEARINGS, Roller
Ball & Roller Bearing Co., Danbury, Conn.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., Harrison, N. J.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Roolway Bearings Co., Inc., 541 Seymour St., Syracuse, N. Y.
Timken Roller Bearing Co., Canton, Ohio.

BEARINGS, Self-Lubricating (Oilness)
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.

BEARINGS, Tapered Roller
Timken Roller Bearing Co., Canton, Ohio.

BEARINGS, Thrust
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Fafnir Bearing Co., New Britain, Conn.
General Electric Co., Schenectady, N. Y.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearing Co., Inc., Syracuse, N. Y.
Timken Roller Bearing Co., Canton, Ohio.

BELT SHIFTERS
Standard Pressed Steel Co., Jenkintown, Pa.

BELTING, Transmission
Houghton, E. F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.

BENCHES, Work, and Bench Legs
Standard Pressed Steel Co., Jenkintown, Pa.

BENDING MACHINES, Angle Iron, Plate, Etc.
Consolidated Mch. Tool Corp., 656 Blossom Rd., Rochester, N. Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

(*Continued on page 282*)

For more information on products advertised, use Inquiry Card, page 241

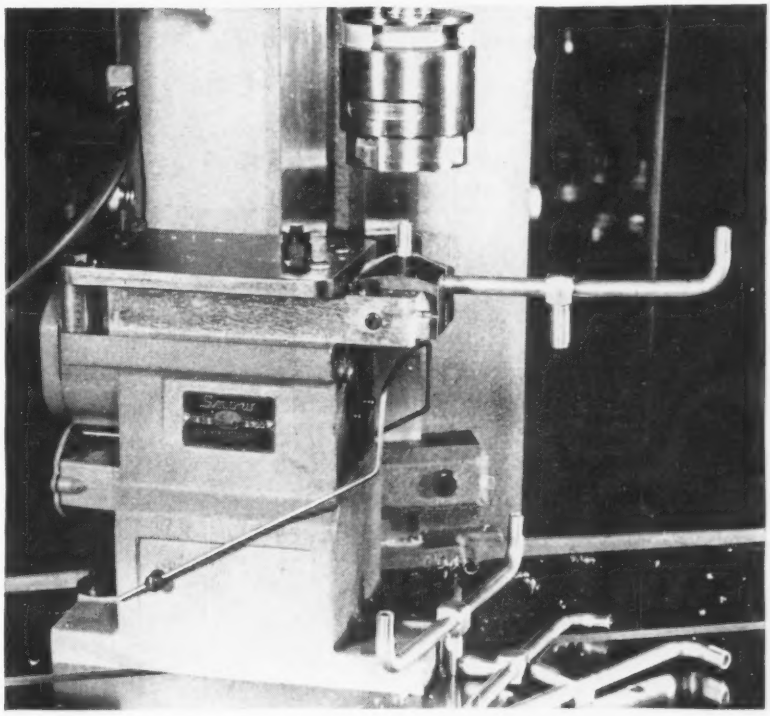
Quicker changeover, lower tooling costs...

with SNOW FULL UNIVERSAL MACHINES

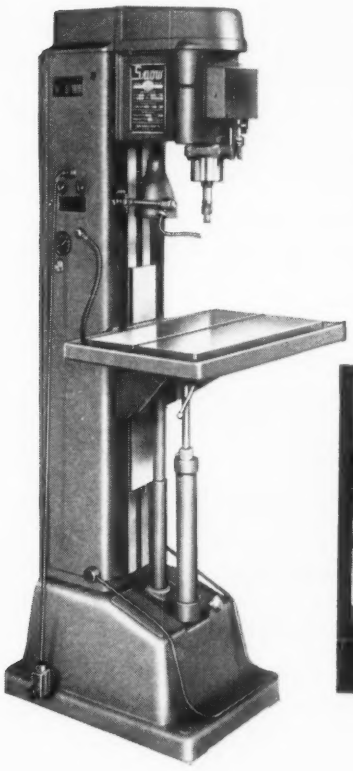
ELECTRICALLY OPERATED AIR CONTROLLED AUTOMATIC OR SEMI-AUTOMATIC

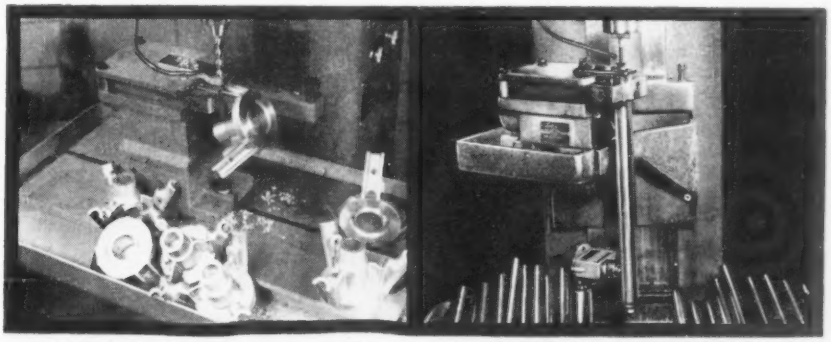
Basic Master Fixtures for DRILLING, THREADING or TAPPING. Snow universal machines are the most flexible, most efficient, and most economical known. They save countless dollars in changeover time — help you start jobs sooner — assure quality at high production rates.

The square footage under a Snow Machine in your factory can be the most profitable in your whole plant. Submit details of your requirements.



AIR VISE holds part firmly — self-centering — always in exact position for precision work. U-shaped wire underneath provides quick finger-tip control, automatically starting spindle cycle. Jaw inserts keep tooling costs at minimum. Blank jaws always in stock — can be tooled to fit your part promptly, inexpensively.

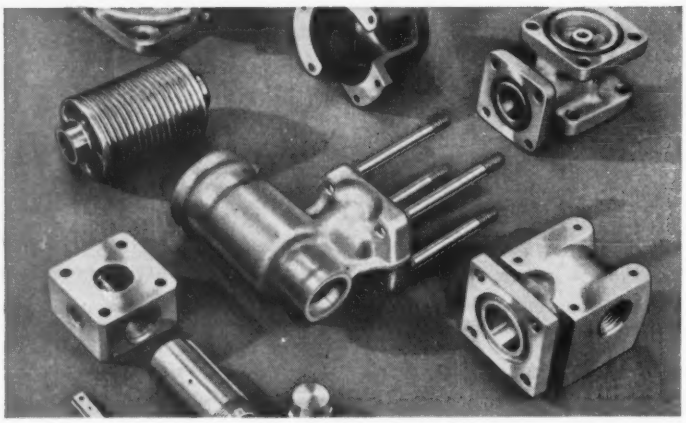




Irregularly shaped parts are easily handled. Front feed permits close setting of guide plate for greater accuracy with high production.

Here a short AIR VISE mounted on an offset table holds long tubing. Piece-part switch under table automatically closes vise and starts tapping operation.

SNOW MANUFACTURING CO., BELLWOOD, ILL.
(Suburb of Chicago)



Industry depends upon the special skill of overhead linemen to keep the "hot" wires carrying power to turn the wheels. Many product manufacturers depend upon the special skills of Vinco production personnel to supply component parts. Because these parts are supplied at competitive costs and with a very minimum of scrap, they create an added profit for the customer.

All tools and gages used for mass producing component parts from ferrous or non-ferrous metals are designed and made to Vinco high standards in its tool and gage plant.

Let Vinco specialists prove that they are your best bet!
Vinco Corp., 9113 Schaefer Hwy., Detroit 28, Mich.

Gear Pumps • Master Gears • Commercial Gears
B-1 Formed Wheel Dressers • Spline Gages
Optical Master Inspection Dividing Heads
Camshaft Comparators • Involute Checkers
Precisiondex • Gear Rolling Inspection Fixtures ®

TRADEMARK OF DEPENDABILITY

VINCO

MILLIONTHS OF AN INCH FOR SALE

BENDING MACHINES, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Chambersburg Engrg Co., Chambersburg, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 30 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg Corp., Kenmore Sta., Buffalo, N. Y.
Niagara Machne & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

BENDING MACHINES, Pipe

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Watson-Stillman Co., Div., H. K. Porter Co., Inc., Roselle, N. J.

BLAST CLEANING EQUIPMENT

Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Pangborn Corp., Hagerstown, Md.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

BLOWERS

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

BLUING LAYOUT

Dykem Co., 2303P. N. 11th St., St. Louis 6, Mo.

BOILER TUBES

Bethlehem Steel Co., Bethlehem, Pa.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

BOLT AND NUT MACHINERY

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
New Britain Machine Co., New Britain-Gridley Mch. Div., New Britain, Conn.

BOLTS AND NUTS

Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only)
Bethlehem Steel Co., Bethlehem, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, W. H., & Co., York, Pa.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.

BOOKS, Technical

Industrial Press, 148 Lafayette St., New York 13, N. Y.
Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.

BORING AND DRILLING MACHINES

Baker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.

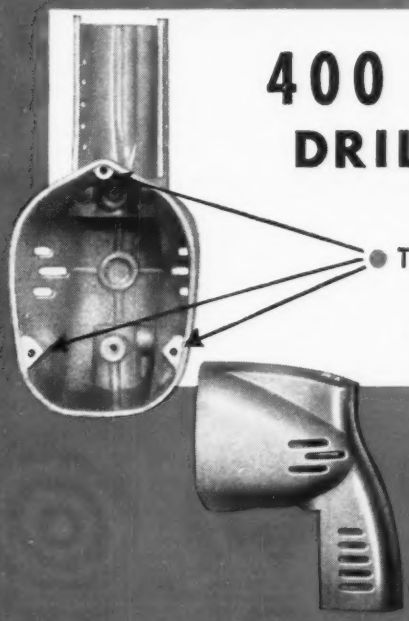
(*Continued on page* 284)

For more information on products advertised, use Inquiry Card, page 241

AN A33A NATCO PROVIDES

High Production plus Flexibility

FOR THOSE SMALL PARTS



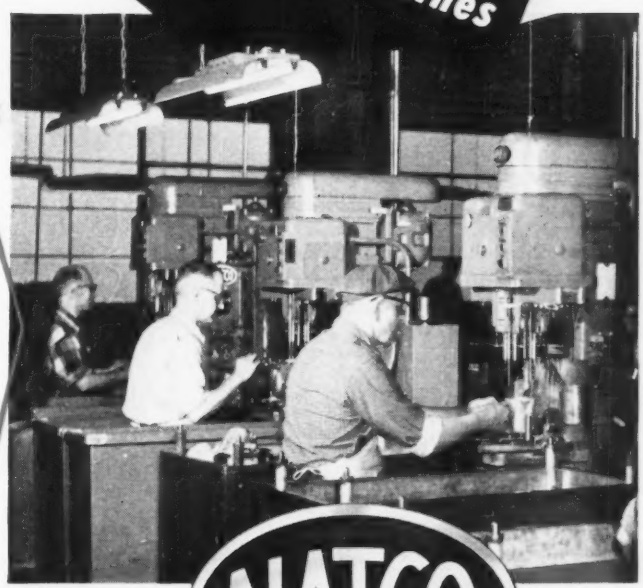
400 SMALL PARTS DRILLED or TAPPED PER HOUR

- THREE .1065 HOLES DRILLED OR TAPPED 6-32 TAP IN HAND DRILL HOUSING

JUST ONE OF MANY PARTS drilled and tapped on these NATCO High-Speed adjustable A33A machines

Another example of light sensitive machines

NATCO ENGINEERED for Quality and Quantity Production



NATCO DRILLING, BORING, FACING AND TAPPING MACHINES

NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

Branch Offices: CHICAGO, 2009 Engineering Bldg. • DETROIT, 409 New Center Bldg.

BUFFALO, 1807 Elmwood Ave. • NEW YORK, 35 Beechwood Ave., Mount Vernon

Call a Natco Field Engineer

On hydraulic applications LATTICE BRAID* Flax Packing holds together even when worn, outlasts ordinary packings 3 to 1

*Registered Trademark. *Only* Garlock makes LATTICE BRAID rod and shaft packings.

Check these typical service reports:

- *Locomotive Manufacturer*—Hydraulic pumps handling water, 1,500 to 2,000 p.s.i. Garlock 745 LATTICE BRAID Flax packing gives from 4 to 12 months service where previous braided packings lasted a maximum of a few weeks.
- *Steel Company*—Hydraulic accumulator handling cold water, 5,000 p.s.i Best service from previous packings 6 weeks to 2 months. Garlock 745 LATTICE BRAID Flax packing lasts 6 months, rings form better in stuffing box, do not tear in service.
- *Rubber Company*—Hydraulic presses handling water, 160° F., 2,100 p.s.i., ¾" packing, plungers worn and rough. Maximum service from previous packings 1 month. Garlock 745 LATTICE BRAID Flax packing lasts 4 months.
- *Steel Company*—Hydraulic accumulator handling water, 800 p.s.i., 48" ram, 1" packing. Previous packings lasted 6 to 8 months. Garlock 740 LATTICE BRAID Flax packing gives 2½ years service.

Get all the facts about LATTICE BRAID *Packings. Contact your Garlock representative or write for new folder AD-131.*

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK

Sales Offices and Warehouses: Baltimore • Birmingham • Boston • Buffalo • Chicago • Cincinnati • Cleveland Denver • Detroit • Houston • Los Angeles • New Orleans • New York City • Palmyra (N. Y.) • Philadelphia Pittsburgh • Portland (Oregon) • Salt Lake City • San Francisco • St. Louis • Seattle • Spokane • Tulsa.

In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

GARLOCK LATTICE BRAID PACKING

Bullard Co., Brewster St., Bridgeport 2, Conn.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kaukauna Mch. Corp., Kaukauna, Wis.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Wales-Strippet Corp., North Tonawanda, N. Y.

BORING AND TURNING MILLS, Vertical

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

BORING BARS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

BORING, DRILLING AND MILLING MACHINES, Horizontal

(Floor, Planer or Table Types)

Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 120 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn. R. R., Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Lucas Mch. Tool Div., New Britain Mch. Co., 12302 Kirby Ave., Cleveland 8, Ohio.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Portage Machine Co., 1069 Sweitzer Ave., Akron 11, Ohio.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

BORING HEADS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.

(*Continued on page* 286)

For more information on products advertised, use Inquiry Card, page 241

No. 50 Sunnen Honing Machines
SUNNEN HONING Machines To Size and Finish INTERNAL DIAMETERS
SUNNEN Portable Hones
No. 51 Sunnen Portable Cylinder Hones
NEW MANDREL SETS for TOOL ROOMS
No. 55 Sunnen Tool Room Honing
STONES MANDRELS and ACCESSORIES for the SUNNEN PRECISION HONING MACHINES
SUNNEN
No. 505 Sunnen Honing Supplies & Accessories
SUNNEN External Hone...
No. 58 Sunnen External Hones
TYPICAL APPLICATIONS
105 Case Histories
SUNNEN HONING MACHINES
No. 60 Sunnen Honing Case Histories

These 6 FREE BOOKLETS show how

SUNNEN® HONING

May help you solve your production problems on bores and shafts

If your problem is how to meet newer, more exact specifications on bores, shafts and surface finishes, you'll want these booklets. They tell you how other manufacturers are improving their products by honing . . . making them last longer and run smoother and cooler . . . making higher speeds permissible . . . all by using Sunnen Honing to produce smooth, accurate bushings and bores, as well as spindles, shafts, plungers and similar parts.

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☐ No. 55 ☐ No. 58 ☐ No. 60

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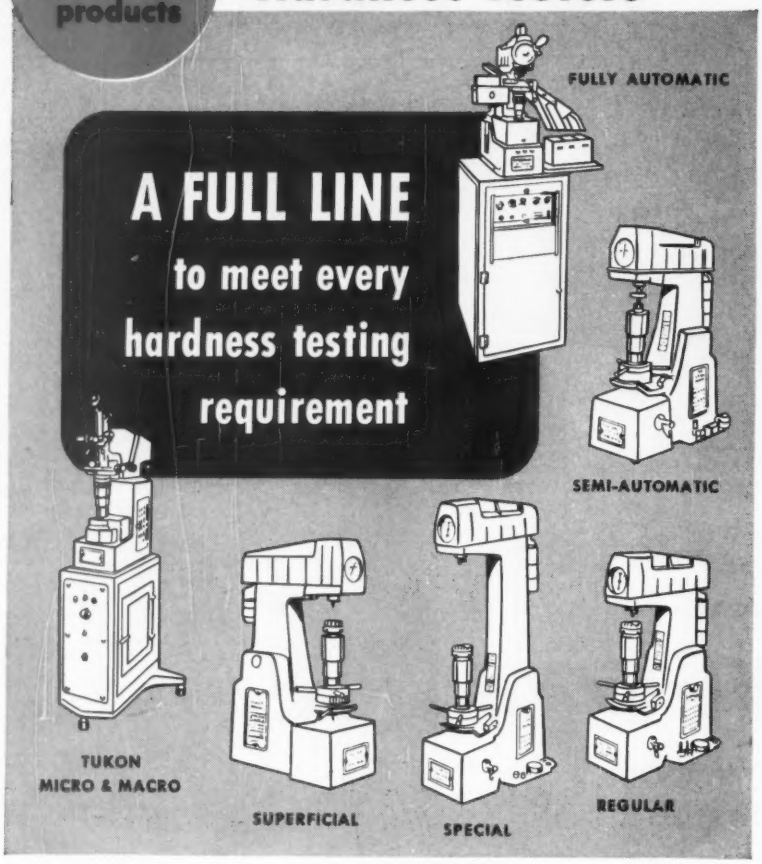
ACCO products

Wilson "Rockwell"* Hardness Testers



• Hardness testing standards of the metal industry have been set and maintained by WILSON "Rockwell" Hardness Testers since 1921. In steel mills, non-ferrous mills and metal fabricating plants everywhere, WILSON "Rockwell" standards have been the mark of perfection for a generation.

What is your testing problem? Whether your material is hardened steel, sheet metal, small parts, tools, rounds, tubes, soft metals or plastic materials—all are tested quickly and accurately by one of the many WILSON models.

WILSON "Rockwell" precision has made them the standard by which all other hardness testers are compared. The WILSON full line makes it unnecessary to compromise with less than the tester most suited to *your* requirement.

Let a WILSON expert discuss your hardness testing problem. There is no obligation.

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ACCO Wilson Mechanical Instrument Division
AMERICAN CHAIN & CABLE
230-D Park Avenue, New York 17, N. Y.

plus BRALES and TUKON

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Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Mummert-Dixon Co., Hanover, Pa.
Taft-Peirce Mfg Co., Woonsocket, R. I.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

BORING MACHINES

Bryant Chucking Grinder Co., Springfield, Vt.
Chandler Tool Co., 514 Ohio Ave., Muncie, Ind.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.

BORING MACHINES, Jig

American Sip Corp., 100 E. 42nd St., New York 17, N. Y.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Wales-Strippet Corp., North Tonawanda, N. Y.

BORING TOOLS

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit, Mich.
Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

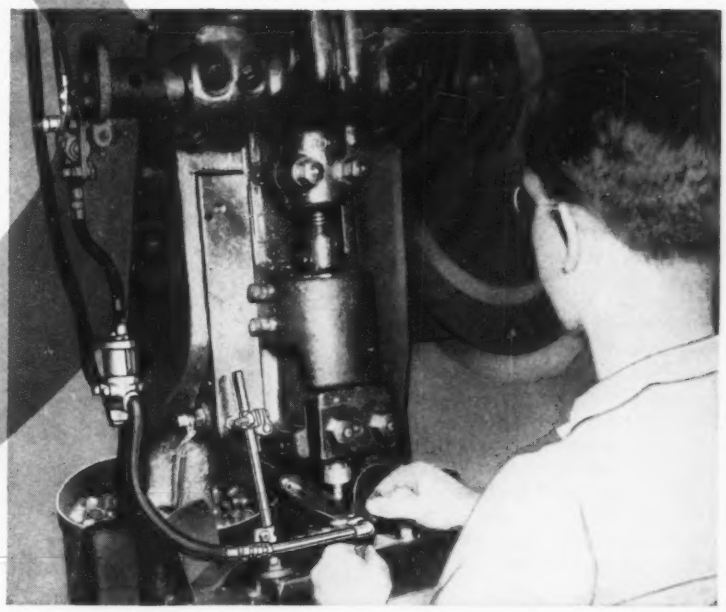
BRAKES, Press and Bending

Bliss, E. W., Co., 1375 Raff Road, S. W., Canton, Ohio.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio.

(*Continued on page* 288)

For more information on products advertised, use Inquiry Card, page 241

how much can air ejection boost your production

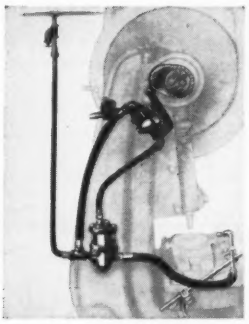


Actually, it can *double production.* With Schrader Air Ejection Sets on your presses, after each press cycle, there's a quick puff of air—automatically timed to do the job just right—and you're set for the next blank to be inserted.

No more tedious, dangerous hand removal!
No more wasteful steady air blasts!

Schrader Air Ejection Sets come in many types to suit any need. You can buy them for cam operation off the crankshaft, or for roller tripper actuation from the ram. If the parts you are fabricating are too heavy to be blown from the dies by an air blast, the Schrader Cylinder Knockout Set is available, which utilizes the knockout force available from a push-type Schrader Cylinder.

But regardless of the type of ejection set you need, you'll find one exactly suited to your requirements at Schrader. Schrader Air Ejection Sets come complete with all necessary fittings, valves, hose and air line accessories—all ready to be bolted to your press. Write today for full details.



This is the Schrader No. 3208W Air Ejection Set. Similar sets are available for cam or tripper operation, with or without pilot valve timing.

Schrader
REG. U. S. PAT. OFF.

leaders in air control

since 1844

Air Cylinders • Operating Valves • Press & Shear Controls • Air Ejection Sets • Blow Guns • Air Line Couplers • Air Hose & Fittings • Hose Reels • Pressure Regulators & Oilers • Air Strainers • Hydraulic Gauges • Uniflare Tube Fittings

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SET A STEADY PACE FOR YOUR TOOLROOM with OLIVER ACE

Universal Tool and Cutter Grinders

No "broken" production steps with the Oliver ACE. It reduces time lags to a minimum because its *simplicity of design and operation* makes economy of motion and fast grinding certain.

The Oliver ACE is so designed that only two simple fixtures are required for a general range of cutters. The ACE is especially built to handle a wider variety of cutter grinding and perform jobs for which ordinary cutter grinders are not designed. The ACE has only one sliding part with ample bearing efficiently protected from dust.

Direct Reading for Clearance
—Reduces Fatigue
—Eases Operators' Jobs

Always insuring lasting accuracy, the Oliver ACE handles the most difficult and the toughest grinding jobs . . . diamond-hard Tungsten-Carbide work and high speed milling cutters and tools are ground with ease. Easy to set-up, the precision built ACE requires no computation. Worker fatigue is greatly reduced because the Oliver ACE permits direct reading for clearance . . . no stoop . . . no squat . . . no squint.

Time proved and soundly engineered, the ACE economizes on floor space . . . saves valuable time . . . gives you guaranteed precision. It substantiates Oliver of Adrian's world-wide reputation as a superior designer and builder of lasting . . . more accurate machine tools.

Priced to meet your budget, the ACE excels for grinding face mills up to 15"—also, slab mills • slitting saws • dovetail cutters • angular cutters • double angle cutters • Fellows helical cutters • reamers • taper reamers • production gashing and carbide tipped circular wood saws.

2 MODELS: Standard and Heavy Duty (illustrated)
Write Today for Complete Data
See our Catalog in Sweet's Directory

OLIVER INSTRUMENT CO.
1410 E. MAUMEE • ADRIAN, MICHIGAN

MACHINE TOOLS by OLIVER include:
AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS
DRILL POINT THINNERS
TEMPLATE TOOL GRINDERS
FACE MILL GRINDERS
DIE MAKING MACHINES

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Ferracute Machine Co., Bridgeton, N. J.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

BROACHES

American Broach & Mch. Co., Ann Arbor Mich.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
duMont Corp., Greenfield, Mass.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BROACHING MACHINES

American Broach & Mch. Co., Ann Arbor, Mich.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Foote-Burt Co., 130 St. Clair Ave., Cleveland 8, Ohio.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
Zagar Tool Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BRONZE

American Brass Co., Waterbury 20, Conn.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.
Mueller Brass Co., Port Huron 35, Mich.

BRUSHES, Industrial, Wire Wheel, Etc.

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.
Pittsburgh Plate Glass Co., Brush Div., Baltimore 29, Md.

BUFFERS

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

BULLDOZERS

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div., H. K. Porter Co., Inc., Roselle, N. J.

BURS

See Files and Burs, Rotary

BUSHINGS, Brass, Bronze, Carbide, Etc.

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Johnson Bronze Co., New Castle, Pa.
Kennametal, Inc., Latrobe, Pa.

(*Continued on page 290*)

For more information on products advertised, use Inquiry Card, page 241

THE MOST UP-TO-DATE AND COMPLETE CARBIDE TOOL CATALOG AVAILABLE

- A completely new carbide tool catalog, shadow indexed for ready reference.
- 92 pages contain complete listings on Super Standard Carbide Tools, sizes and engineering information.
- Many new carbide tools cataloged for the first time, including an extended line of solid carbides.

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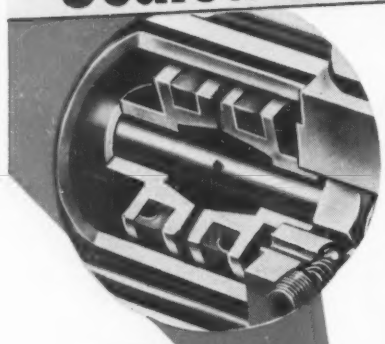
TOOL COMPANY

21660 Hoover Rd., Detroit 13, Michigan • 5210 San Fernando Rd., Los Angeles 3, California

"Sealed-in Lubrication"

Pat. Pend.



Cut-a-way shows oil reservoir in lubrication pistons.

Wick, inserted in groove between U-cups, supplies a constant film of oil to the full inside cylinder wall. Radial holes, drilled through from the groove to the reservoir, supply oil to the wick by capillary action. This assures low break-away action even if cylinder has been long idle.

Sealed-in oil is ample for thousands of cycles without attention.

It's another LEHIGH quality exclusive. See catalog for many additional features.

Lehigh HEAVY DUTY AIR MOTORS

For converting any foot or hand operation on tools, processing or handling equipment to semi or completely automatic operation.

Combines a LEHIGH Double-Acting, Self-Lubricating Cylinder with a LEHIGH 4-way Air Powered Valve and a wide choice of electric and/or air controls and mountings.

For air pressures up to 200 P.S.I. Standard bores: 1½" — 2" — 3". Any desired stroke. Larger bores on special order.

Built to rigid quality standards, proved by long years of use, used as "standard equipment" on many famous machines. Backed by nation-wide field engineering service.

Write for catalogs and name of nearest Lehigh representative

Lehigh INC.

ENGINEERS AND MANUFACTURERS
1507 Lehigh Drive
EASTON, PENNSYLVANIA

SELF-LUBRICATING AIR CYLINDERS

Standard bores 1½" to 8". Exceptionally compact mounting dimensions.

3 or 4-way AIR POWERED VALVES

Made to J.I.C. standards. Wide range of models — air or electrically controlled.

Lehigh Minor AIR VALVES & CYLINDERS

Low priced cylinders and valves for light duty operation. Ideal for air operated jigs and fixtures and for high speed operations.

COMBINATION VALVES

—panel units, hand and foot operated valves and a complete line of air control equipment.

Lehigh INC.

ELECTRIC FOUNDRY PRODUCTS. PROFILE TRACING LATHE ATTACHMENTS. COMMERCIAL REFRIGERATION SYSTEMS. AUTOMATIC VENDING MACHINES.

BUSHINGS, Hardened

Colonial Bushings, Inc., 31780 Groesbeck Hwy., Fraser, Mich.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
U. S. Steel Co., Inc., 436 7th Ave., Pittsburgh, Pa.
U. S. Tool Co., Inc., 255 N. 18th St., Ampere, N. J.

BUSHINGS, Jig

Colonial Bushings, Inc., 31780 Groesbeck Hwy., Fraser, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Universal Engrg. Co., Frankenmuth, Mich.

CABINETS, Tool

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

CALIPERS

Ames, B. C., & Co. (Dial) Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starret, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

CAM CUTTING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sunstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

CAM MILLING AND GRINDING MACHINES

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Landis Tool Co., Waynesboro, Pa.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Rowbottom Machine Co., Waterbury, Conn.

CAMS

Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Rowbottom Machine Co., Waterbury, Conn.

CARBIDES, TANTALUM, TITANIUM AND TUNGSTEN

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Valenite Metals Corp., Box 205, Royal Oak, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Wesson Metal Corp., Lexington, Ky.
Willey's Carbide Tool Corp., 1340 W. Vernor Hwy., Detroit 1, Mich.

CASEHARDENING FURNACES

See Furnaces, Heat-Treating

(*Continued on page* 292)

For more information on products advertised, use Inquiry Card, page 241

"Broaching 4140 Steel was giving them a tough time..."

A Michigan manufacturing company broaching 4140 Steel in a horizontal machine found their broach life unusually *low*. The machine shop superintendent tried a number of oils recommended by various companies, but found none satisfactory either for increasing tool life or producing the desired finish. On a routine call, Sinclair Industrial Representative M. L. Howland was asked for his recommendations.

Overheating was the villain...

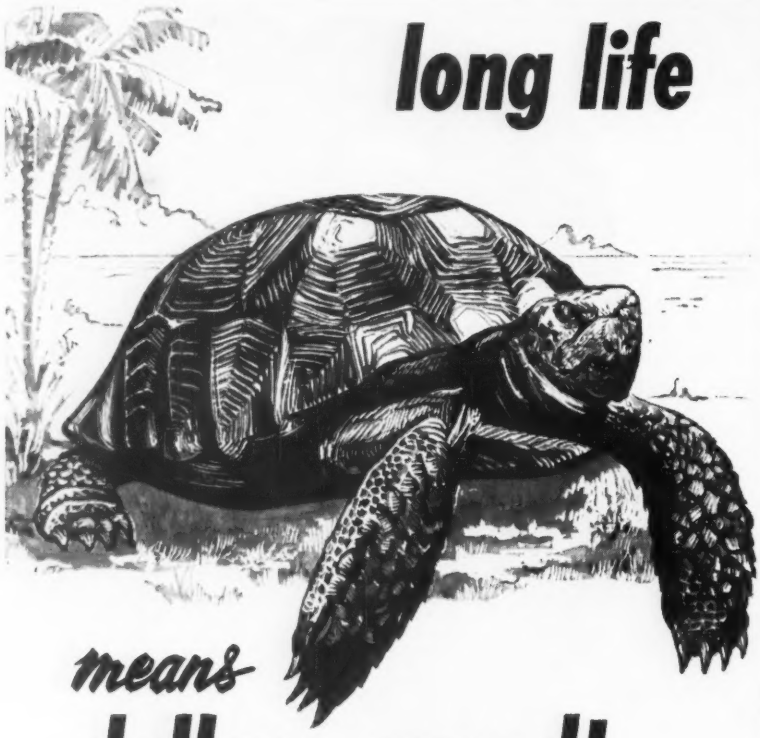
Mr. Howland reports, "Overheating was the reason these tools were taking a beating. Examination showed the need for an oil with proper anti-weld, extreme pressure characteristics and correct viscosity. From previous experience, I recommended Sinclair ORDNANCE B, a heavy duty cutting oil."

Broach life doubled...

Mr. Howland continues, "Following my recommendations, the superintendent tried Sinclair ORDNANCE B on a test basis. On a follow-up, I learned that the broach life had been *doubled* and the finished pieces were free from tool marks. The company now specifies Sinclair ORDNANCE B *100% for its broaching operations.*"

Why not let a Sinclair Lubrication Engineer help solve *your* lubrication problem. *There's no obligation.* Contact your local Sinclair office or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N.Y.

SINCLAIR LUBRICANTS



long life

means

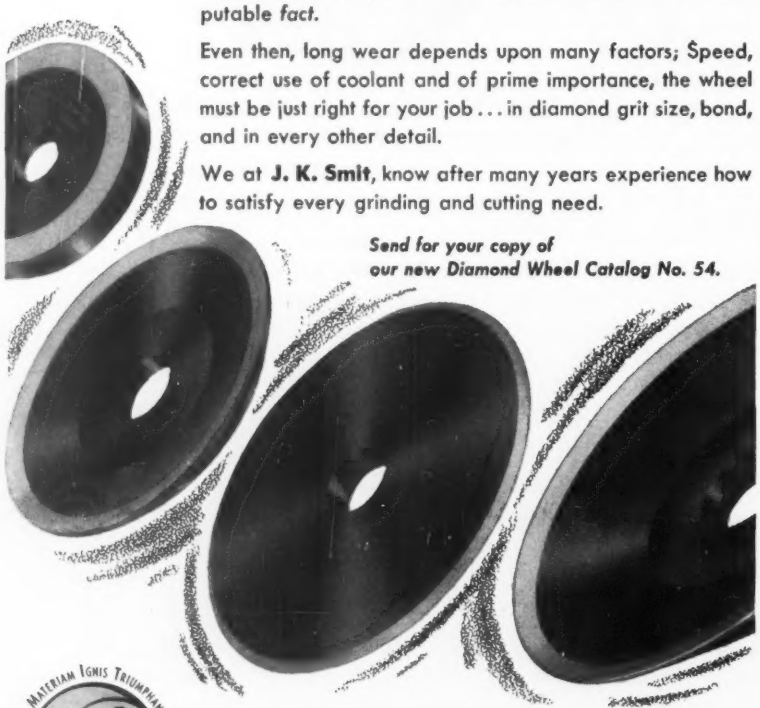
dollars saved!

Whether a 200 year old tortoise would admit this statement is debatable, but with Diamond Wheels it is an indisputable *fact.*

Even then, long wear depends upon many factors; Speed, correct use of coolant and of prime importance, the wheel must be just right for your job . . . in diamond grit size, bond, and in every other detail.

We at **J. K. Smit,** know after many years experience how to satisfy every grinding and cutting need.

Send for your copy of our new Diamond Wheel Catalog No. 54.



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J. K. SMIT & SONS, INC.

HOME OFFICE AND PLANT

MURRAY HILL NEW JERSEY

Additional plants in London, Paris, Amsterdam and Toronto, Canada

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Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co. (Brass and Bronze only), Bethlehem, Pa.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Mueller Brass Co., Port Huron 35, Mich.

CASTINGS, Die

American Brass Co., Waterbury 20, Conn.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Madison-Kipp Corp., Madison, Wisc.

CASTINGS, Iron

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engineering Co., Chambersburg, Pa.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Link-Belt Co., 180 W. Duncannon Ave., Philadelphia 20, Pa.

CASTINGS, Steel, Alloys, Etc.

Allegheny Ludlum Steel Corp, Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Dv., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Lebanon Steel Foundry, Dept. J, Lebanon, Pa.
Link-Belt Co., 180 W. Duncannon Ave., Philadelphia 20, Pa.
U. S. Steel Corp., Columbia Steel Co., Div., 436 7th Ave., Pittsburgh, Pa.

CEMENT, Disc Grinding Wheel

Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

CENTERING MACHINES

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Machine Works, Front St., and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., Springfield, Vt.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sunstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

CENTERS, Lathe

Axelson Mfg. Co., P. O. Box 15335, Verona St., Los Angeles 58, Cal.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., Cleveland, Ohio.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

(*Continued on page* 294)

For more information on products advertised, use Inquiry Card, page 241

a practical approach to pressroom modernization

Announcing

TWO NEW Verson PLANS

to solve press obsolescence problems

The extensive capital expenditures required to meet competitive pressures have put many manufacturers in an unfortunate position. Modernization is necessary if the manufacturer is to price his product competitively and still make a fair profit. However, the fair profit is necessary before he can afford the modernization. Two new Verson plans make it possible to modernize now and pay for it out of the increased profits it provides. If you are one of the manufacturers faced with the dilemma of needing modernization for better profits, but needing better profits before you can afford modernization, one of these plans may be the answer to your problems.

Customized

INSTALLMENT PROGRAM

For the manufacturer who wishes to own his own presses but minimize his initial capital outlay, Verson offers a Customized Installment Program. It is called "Customized" because the payment plan is tailored to the buyer's own financial requirements rather than to a single fixed plan. Initial payments may be as low as 10 per cent of the purchase price with the balance payable over periods ranging from six months to five years. Further information on a plan to meet your needs will be furnished on request. Please outline your requirements.

Customized

LEASING PROGRAM

For the manufacturer who wants the advantages of modern, efficient presses without capital investment, Verson offers a Customized Leasing Program. Like the Installment Program, a choice of plans is available to best suit the buyer's requirements. In addition to the basic plans, options for continuation, termination and eventual purchase are also available. Special arrangements for special machines will be considered. Further information on a leasing plan to suit your needs will be furnished on request. Please outline your requirements.

A Verson Press for every job from 60 tons up.

Verson

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

VERSON ALLSTEEL PRESS CO.

9309 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS • SO. LAMAR AT LEDBETTER DRIVE, DALLAS, TEXAS

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

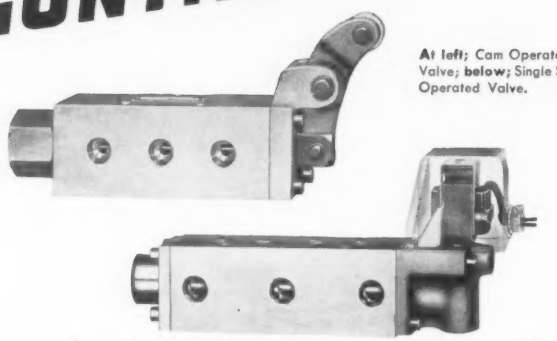
For more information on products advertised, use Inquiry Card, page 241

SELECT

Quick-As-Wink®

AIR AND HYDRAULIC

CONTROL VALVES



At left; Cam Operated Type "O" Valve; below; Single Solenoid Pilot Operated Valve.

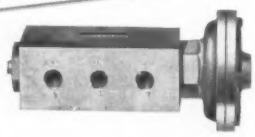
They're designed to give you the fast dependable trouble-free action you need

for single or sequence machine movements

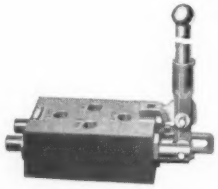
• Those successive and inter-related machine operations — that speed manufacture and cut costs — can only be as successful as the air and hydraulic valves that control the operations. Specify Quick-As-Wink Control Valves.

Positive and fast acting, Quick-As-Wink valves are designed and built to meet the most exacting requirements. They will deliver dependable and precision performance month after month, and year after year. Many superintendents and foremen have found that there is nothing better than a Quick-As-Wink valve. Can you afford to gamble with less? Get full details. Write for Bulletin No. 531 today!

Ask us also about . . .



DIAPHRAGM OPERATED "O-TYPE" VALVE, diaphragm can be actuated with instrument air as low as 12 to 15 psi.



LEVER OPERATED HYDRAULIC VALVE suited for water or hydraulic oils up to 5000 psi. 2-way, 3-way and 4-way actions.

Quick-As-Wink

AIR AND HYDRAULIC

Control Valves

Hand, Foot, Cam, Pilot, Diaphragm and Solenoid Operated

Mfd. by C. B. HUNT & SON, INC., 1947 East Pershing St., Salem, Ohio

CHAINS, Power Transmission and Conveyor

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

CHISELS AND CHISEL BLANKS

Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.

CHUCKING MACHINES

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Goss & DeLeeuw Mch. Co. (Multple Spindle), Kensington, Conn.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
National Acme Co., (Single and Multple Spindle) 170 E. 131st St., Cleveland, Ohio.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Sunstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 83, Ohio.

CHUCKS, Air Operated

Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Schraders Son, A., 470 Vanderbilt Avenue, Brooklyn, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Tomkins-Johnson Co., Jackson, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Collet or Split

See Collets

CHUCKS, Diaphragm

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Gleason Works, 1000 University Ave., Rochester, N. Y.
Van Norman Co., 2640 Main St., Springfield 7, Mass.

CHUCKS, Drill

Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

CHUCKS, Full Floating

Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.
Gisholt Mch. Co., Madison 10, Wis.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.

(*Continued on page* 296)

For more information on products advertised, use Inquiry Card, page 241

the BUSIEST press at LENNOX FURNACE

no downtime reported for this H-P-M Hydraulic

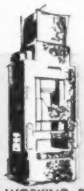
If you've a spot for a real "workhorse" let the Lennox story prove a point. This versatile H-P-M 400 ton press is used for drawing, blanking, forming and other operations and is really paying its way in production output at The Lennox Furnace Company. H-P-M's constant drawing speed . . . smooth fast operation . . . shockless reversal . . . positive overload protection . . . and quick die set up put your toughest metalworking jobs in the profit column. Call in a nearby H-P-M engineer to analyze your parts production. There's no obligation — write today.

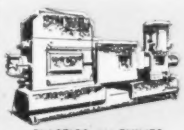
"We've operated our H-P-M, 19 hours a day for the past several years without any downtime — it's the workhorse of the shop!"

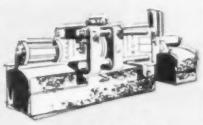
Mr. James H. Bragg
Factory Manager
Marshalltown Plant of
The Lennox Furnace Co.

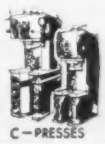
HPM

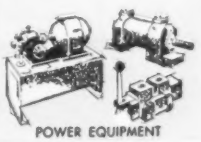
THE HYDRAULIC PRESS MFG. COMPANY
1042 MARION ROAD
Mount Gilead, Ohio, U. S. A.


METAL WORKING PRESS


PLASTICS MACHINES


DIE CASTING MACHINES


C—PRESSES


POWER EQUIPMENT

CHUCKS, Gear
Gleason Works, 1000 University Ave., Rochester, N. Y.

CHUCKS, Lathes, etc.
Buck Tool Co., 220 Schippers La., Kalamazoo, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Gisholt Mch. Co., Madison 10, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Magnetic
Brown & Sharpe Mfg. Co., Prvoidence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Hanchett Magna-Lock Corp., Big Rapids, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

CHUCKS, Power Operated
Skinner Chuck Co., 344 Church St., New Britain, Conn.

CHUCKS, Quick Change and Safety
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.

CHUCKS, Ring Wheel
Gardner Mch. Co., 414 E. Gardner St., Beloit, Wis.

CHUCKS, Tapping
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Jacobs Mfg Co., West Hartford, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.

CIRCUIT-BREAKERS
General Electric Co., Schenect . 5, N. Y.

CLAMPS
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Brown & Sharpe Mfg Co., Providence, R. I.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Mead Specialties Co., 4114 N. Knox Ave., Chicago 41, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Starrett, The L. S., Co., Athol, Mass.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

CLEANERS, Chemical, for Metal
Bullard Co., Bullard-Dunn Process Div., Brewster St., Bridgeport 2, Conn.
Oakite Products, Inc., 19 Rector St., New York, N. Y.
Parker Rust Proof Co., 2194 E. Milwaukee, Detroit 11, Mich.

CLUTCHES
Clearing Mch. Corp., Div. U. S. Industries, Inc., 6499 W. 65th St., Chicago, Ill.
Farrell-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Formsprag Co., 23609 Hoover Rd., Van Dyke, Mich.
Link-Belt Co., 300 West Pershing Rd., Chicago 9, Ill.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Rockford Clutch Div., Borg-Warner Corp., 410 Catherine St., Rockford, Ill.
Twin Disc Clutch Co., 1361 Racine St., Racine Wis.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

COLLARS, Safety
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Standard Pressed Steel Co., Jenkintown, Pa.

COLLETS
Brown & Sharpe Mfg. Co., Provi . e, R. I.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Gisholt Mch. Co., 1245 E. Washington Ave., Madison 10, Wis.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth 2, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

COMPARATORS
See Gages, Comparator.

COMPARATORS, Optical
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Eastman Kodak Co., Rochester, N. Y.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., Springfield, Vt.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

COMPOUNDS, Cleaning
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Oakite Products, Inc., 19 Rector St., New York.

COMPOUNDS, Cutting, Grinding, Metal Drawing, Etc.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Broaching & Lopping).

(*Continued on page 298*)

For more information on products advertised, use Inquiry Card, page 241

"Constant Quality" Tungsten Carbide From The World's Newest Carbide Plant

VALENITE

New methods . . . fresh ideas . . . specially designed equipment . . . top carbide engineers . . . three years of thorough planning and perfecting to bring you *"CONSTANT QUALITY"* TUNGSTEN CARBIDE.

Valenite's performance has been proved by long runs on some of the country's toughest cutting jobs. It has what it takes to stand the gaff, hour after hour, day after day.

Valenite will show you on your production line what "Constant Quality" can save you in time and money.

Write for Valenite's complete catalog of "Constant Quality" carbide tips and tools.

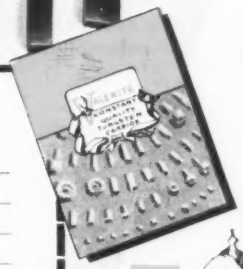
Please send without charge the new Valenite Catalog—A-3

Name_____ Title_____

Company_____

Address_____

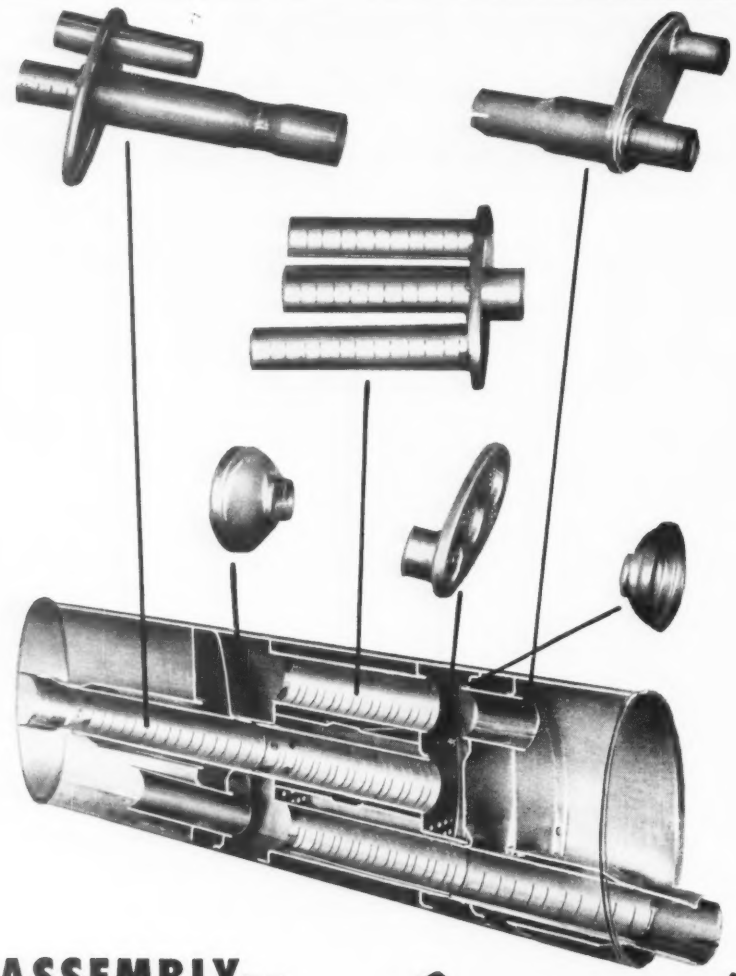
City_____ Zone____ State_____



VALENITE

METALS CORPORATION

Box 205 • Royal Oak, Michigan



ASSEMBLY-- WELDING TIME 6 SECONDS!

Six individual baffle assemblies are inserted into muffler shell, accurately positioned and securely welded. Total elapsed time for completed job is an amazing six seconds.

In this short interval 96 spot welds are made — 16 welds each to the six baffle assemblies.

This Federal welder replaced several individual spot welders, eliminated a great amount of handling and boosted production by some 200 per cent.

It's the type of thing Federal engineers have been doing consistently for some of America's leading fabricators. Why not talk over your welding operation with a Federal man. There's no obligation and chances are he can show you how to reduce your production costs. It's the big reason why **Federal stays — "First in Resistance Welding."**

Federal WELDERS® Warco PRESSES®

THE FEDERAL MACHINE and WELDER COMPANY
WARREN, OHIO

Oakite Products, Inc., 19 Rector St., New York, N. Y.
Parker Rust Proof Co., 2194 E. Milwaukee, Detroit 11, Mich.
Shear-Speed Chem. Prod. Div., Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.
Sinclair Refining Co., 600 Fifth Ave., New York.
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.

COMPOUNDS, Resin and Moulding

General Electric Co., Schenectady 5, N. Y.

COMPRESSORS, Air

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

CONTOUR FOLLOWER

Axelson Mfg. Co., P. O. Box 15335, Verona St., Los Angeles 58, Cal.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Turchan Follower Machine Co., 8259 Livernois and Alaska Aves., Detroit, Mich.

CONTRACT WORK

Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Columbus Die-Tool Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Eisler Engrg. Co., 760 S. 13th, Newark 3, N. J.
Erie Foundry Co., Erie, Pa.
Fellows Gear Shaper Co., Springfield, Vt.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Hartford Special Machry. Co., 287 Homestead Ave., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland, Ohio.
Minster Machine Co., Minster, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Mummert-Dixon Co., Hanover, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Mch. Tool Co., 250 Kishwaukee St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

CONTROLLERS

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee.
Clark Controller Co., Cleveland, Ohio.
General Electric Co., Schenectady 5, N. Y.

CONTROLS, Thermo

Control Products, Inc., 306 Sussex St., Harrison, N. J.

CONVEYORS FOR DUST, CHIPS, ETC.

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9.

COOLANT SEPARATORS

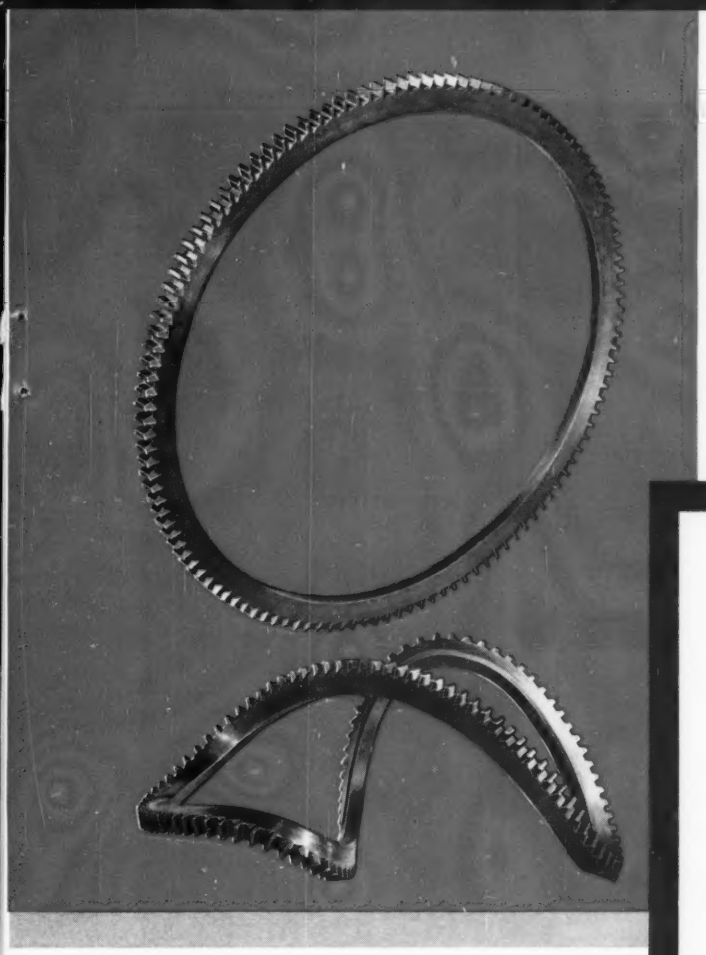
See Separators, Oil or Coolant.

COUNTERBORES

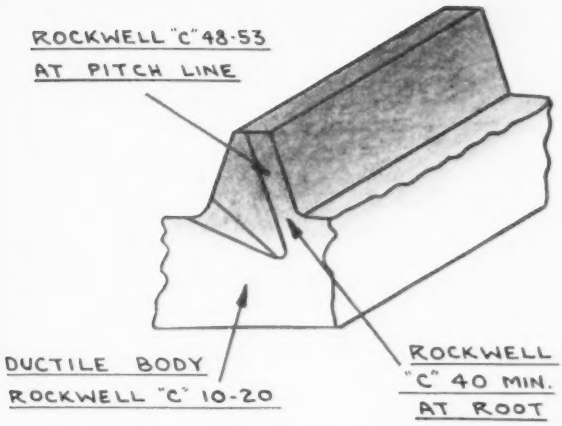
Allen Mfg Co., 133 Sheldon St., Hartford 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.

(*Continued on page* 300)

For more information on products advertised, use Inquiry Card, page 241



THIN! TOUGH! ...and "tender-hearted"



THE MANUFACTURE of flywheel ring gears poses special problems. Sectional thickness is usually less than three-quarters of an inch. To withstand the impact force of the starter pinion, the gear teeth must be hard. But the gear body itself should be unhardened so that it will conform tightly to the flywheel, and "give" under the stress that might snap a brittle gear.

Note how DOUBLE DIAMONDS are made to be thin, tough, "tender-hearted." The above photo of a gear twisted into a pretzel shape graphically demonstrates ductility. The sketch at right shows three important areas: the wide and deep hardness pattern, the generous area of transition, and the ductile body. These extremes are achieved in DOUBLE DIAMOND Flywheel Ring Gears by controlled selective heat treatment—all essential to flywheel ring gears that provide the best possible performance.

Our Engineering Department will be glad to make constructive suggestions on the design of flywheel ring gears, or on the many other types in which we specialize. Write, phone or wire—depending on the urgency of your need.

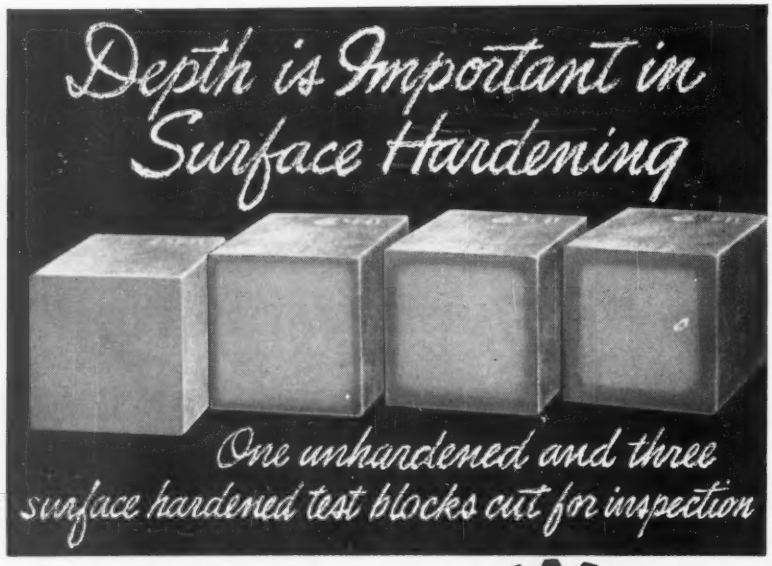
DOUBLE DIAMOND GEARS

FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS
GEAR-MAKERS TO LEADING MANUFACTURERS

Automotive Gear Works, inc.

ESTABLISHED IN 1914

RICHMOND, INDIANA



PITTSBURGH purple

—Your Guarantee of Longer Life

GUARANTEED PITTSBURGH ARMORED PRODUCTS

Trademark Registered U. S. Patent Office

The exact depth of surface hardening is one of the most important factors in the exclusive PITTSBURGH **Armored Gear** formula. The metal, machining, and overall heat-treating are very important in the long service life of PITTSBURGH GEARS, and with surface hardening to the correct depth for the use the gears will be put to, you can expect unusually long service.

PITTSBURGH **Armored Gears** are guaranteed to give five times the life of untreated gears, one to one and one-half the life of oil-treated gears, and equal or longer life than any other gear in identical service. **Armored Gears** are quickly identified by their distinctive corrosion preventive coating of "**Pittsburgh Purple**."

Let us quote on one of your requirements. Then put the PITTSBURGH **Armored Gear** to work. See how much longer it lasts—and how much less your service cost is. Send your specifications today.

SPUR
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WORM GEARS
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CRANE WHEELS

PITTSBURGH GEAR COMPANY

Neville Island
Pittsburgh 25, Pa.
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C Product Directory

Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Starrett, The L. S., Co., Athol, Mass.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Threadwell Tap & Die Co., Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

COUNTERSHAFTS

Standard Pressed Steel Co., Jenkintown, Pa.

COUNTERSINKS

Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 120 Oakman Blvd., Detroit 32, Mich.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
National Twist Drill & Tool Co., Rochester, Mich.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13 Mich.
Union Twist Drill Co., Athol, Mass.

COUNTERS, Revolution

Brown & Sharpe Mfg Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.
Starrett, The L. S., Co., Athol, Mass.

COUNTING DEVICES

Starrett, The L. S., Co., Athol, Mass.

COUPLINGS, Flexible

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Farrell-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.

COUPLINGS, Shaft

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Sier-Bath & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

CRANES, Electric Traveling

Cleveland Crane & Engrg. Co., Wickliffe, Ohio.

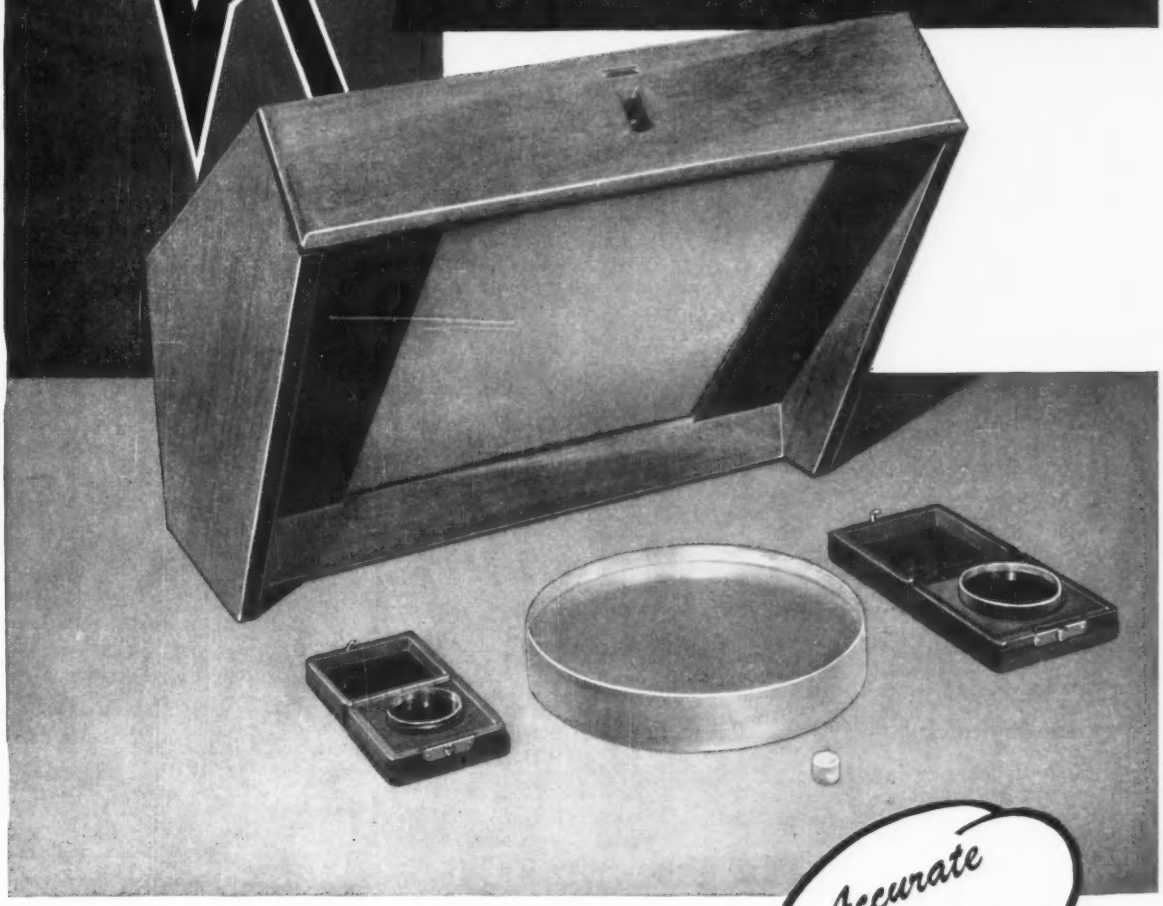
CUTTER GRINDERS

See Grinding Machines, for Sharpening Cutters, Reamers, Hobs, Etc.

(*Continued on page* 302)

fused quartz

VK OPTICAL FLATS



Accurate to .000001"

With VK Optical Flats, close checking of flat surfaces is simplified and more conveniently handled.

Shown here is the new Van Keuren monochromatic light, 22¼" wide, 17¼" high and 20" deep (in bench space). It is designed for use with large optical flats such as the one shown—a 10" diameter fused quartz double-surface master flat (accurate to .000001" both sides).

VK Optical Flats are available in sizes from ½" diameter to 10" diameter in .000001", .000002" or .000004" accuracy. They can be shipped within 30 days from order.

Catalog and Handbook No. 35 is available by writing: The Van Keuren Co., 178 Waltham St., Watertown, Mass. Ask for your copy.

VK

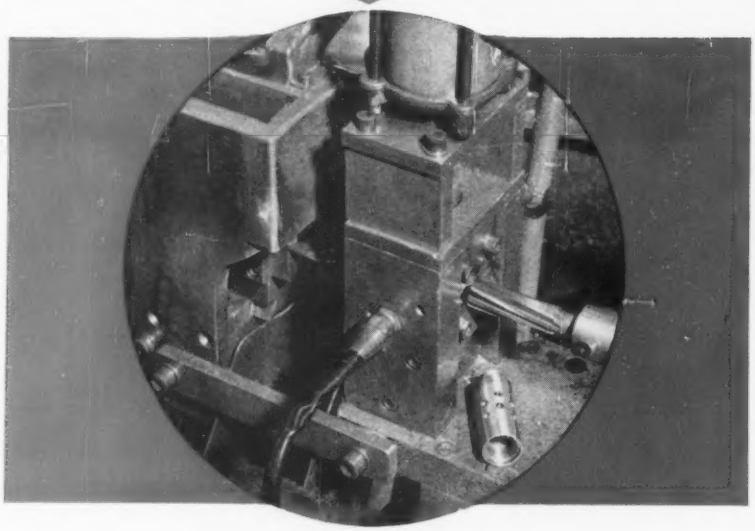
36th YEAR

THE *Van Keuren* CO.,

178 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires Chrome Carbide Taper Insert Plug Gages

HIGH SPEED W&B REAMERS . . .



More Production • Less Resharpening

Shown above is the automatic reaming of fin assemblies for 60 M.M. mortar shells at Columbia Electric Products Company, Spokane. Standard Whitman & Barnes high speed reamers are used to remove the heavy burrs of 16 radially drilled holes in each piece. The reamers are operated at 800 R.P.M. and the production rate is 1,500 pieces per hour. The outstanding performance of these W & B reamers is evident in the fact that Columbia Electric obtains 11,000 reamed fin assemblies per grind. For better reamer performance—specify W & B.

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He can save you money by supplying from his stock . . . what you need when you need it!

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CUTTERS, Gear

Brown & Sharpe Mfg. Co., Providence, R. I.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 6, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Shaving).
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tl. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.
Waltham Mch. Wks., Newton St., Waltham, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Keyseater

Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
duMont Corp., Greenfield, Mass.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson Detroit, Mich.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Threadwell Tap & Die Co., Greenfield, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Milling

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Barber-Colman Co., Rock St., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich. (Thread).
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 1440 Woodrow Wilson, Detroit, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kennametal, Inc., Latrobe, Pa.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tl. Co., Rochester, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

CUTTERS, Rotary

See Files & Burrs Rotary

CUTTING COMPOUNDS

See Compounds, Cutting, grinding, Etc.

CUTTING AND GRINDING FLUIDS

Cincinnati Milling Products Div., Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cimcool Div., Cincinnati Milling Mch. Co., Cincinati, Ohio.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.

(*Continued on page* 304)

For more information on products advertised, use Inquiry Card, page 241

$3190

South Bend No. 2-H Precision Turret Lathe less electrical equipment, f.o.b. factory. Low down payment, up to 24 monthly payments. Only 3¼% interest on original unpaid balance.

A Better Value

SPECIFICATIONS

Hole through spindle	1⅜"
Maximum collet capacity	1"
Swing over bed	16¼"
Spindle speeds (Approx.)	20 to 945 r.p.m.
Effective feed of turret	5⅞"
Diameter of holes in turret head	1½"
Thread cutting range	4 to 224 per in.
Motor required (Two-Speed)	2 - 1 h.p.

The South Bend No. 2-H Turret Lathe has the stamina for exacting close-tolerance work, rigidity for producing fine finishes and ample power for smooth performance. It also has full quick change gear mechanism providing 48 power feeds for the turret ram, 48 power longitudinal feeds for the universal carriage and 48 power cross feeds for the double tool cross slide. The wide selection of feeds insures maximum machining efficiency on every type of operation. Where can you find a better turret lathe value?

Compared with our costs
OUR PRICES ARE LOWER
than they were back in 1941

Prices are closely tied to costs. Costs are still rising. Buy now before increased costs necessitate higher prices.

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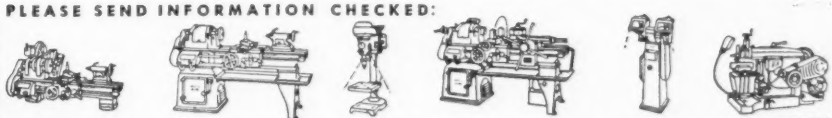


☐ 9" and 10" BENCH LATHES ☐ 10" to 16-24" FLOOR LATHES ☐ DRILL PRESSES ☐ ½" & 1" Collet TURRET LATHES ☐ TOOL GRINDERS ☐ 7" BENCH SHAPERS

Name_____ Street_____

City_____ State_____

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana

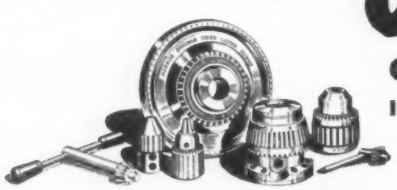
For a **Real Grip** *on things*

Try the Jacobs Ball Bearing Super Chuck. It's a heavy duty chuck for heavy duty drilling . . . a bear for grip and 100% more powerful than comparable plain bearing chucks.

Here's why. The ball thrust bearing rolls away friction between sleeve and nut. Steel jaws close smoothly with tremendous power. The Jacobs Ball Bearing Super Chuck grips harder, and more accurately than any other drill chuck made.

The Super Chuck and the complete line of Jacobs Chucks are stocked and sold by industrial distributors everywhere. See yours, or write Jacobs Mfg. Co., 1702 Jacobs Road, West Hartford 10, Conn. Ask for Catalog 100.

JACOBS AND YOUR LOCAL DISTRIBUTOR
are ready to deliver the chucks you need and the service you deserve.
first in chucks . . . first in service



Jacobs
CHUCKS
If it's a Jacobs it holds

Shear-Speed Chemical Products, Div. Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.
Sinclair Refining Co., 600 Fifth Ave., New York.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.

CUTTING-OFF MACHINES

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Mch. Co., Windsor, Vt. (Lathe Type).
Consolidated Mch. Tool Co., Rochester, N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Johnson Mfg. Co., Albion, Mich.
Landis Machine Co., Waynesboro, Pa., (Pipe).
Modern Machine Tool Co., 601 S. Water St., Jackson, Mich. (Lathe Type for Tubing).

CUTTING-OFF MACHINES, Abrasive Wheel

Allison Co., Bridgeport, Conn.
Columbia Div., Lodge & Shipley Co., Hamilton 1 Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614 G. N. Lexington Ave., Pittsburgh 8, Pa.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.

CUTTING-OFF MACHINES, Cold Saw

See Sewing Machines, Circular.

CUTTING-OFF MACHINES, Metal Band Savs

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Grob, Inc., Grafton, Wis.

CUTTING-OFF TOOLS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Luers, J. Milton, 12 Pine St., Mt. Clemens, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

CUTTING-OFF WHEELS, Abrasive

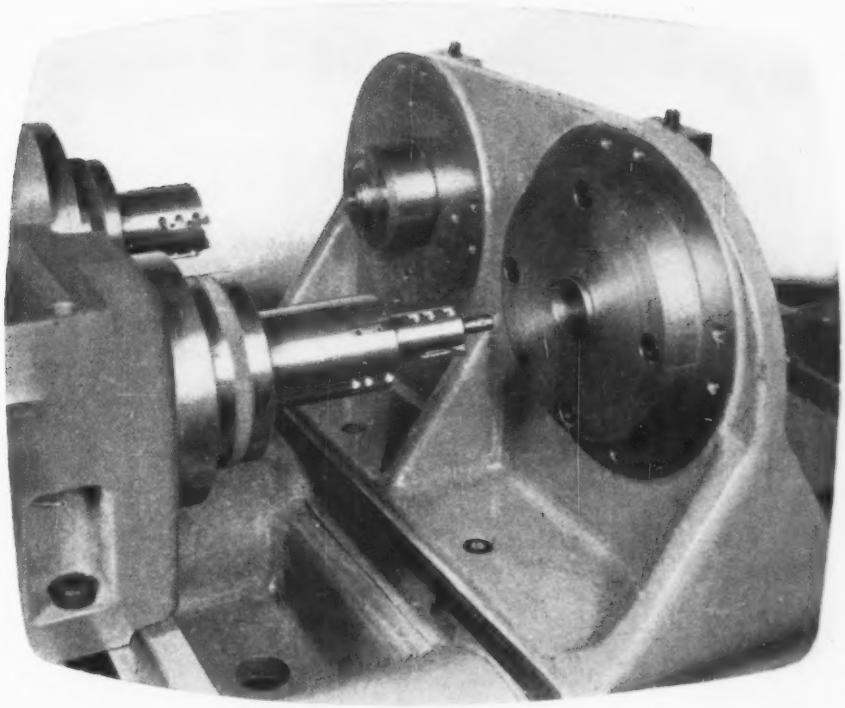
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worcester, Mass.
Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

CYLINDER BORING MACHINES

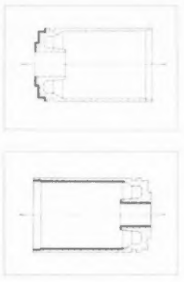
Baker Bros., Inc., Sta. F, P.O. Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Moline Tool Co., 102 20th St., Moline, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

(Continued on page 306)

high precision and production



...on the BRYANT precision boring machine!



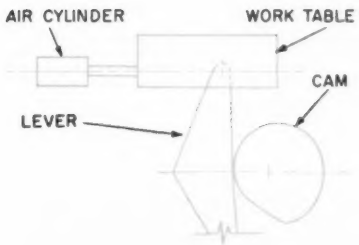
Part — Servo-motor housing, 303 stainless steel, 15 to 18 Rockwell "C".

Operation at rear station
Turn diameter: .875 — .0005, 3/64" long
Turn diameter: 1.312 — .0005, 5/64" long
Finish 3 faces

Operation at front station
Bore diameter: 1.397 + .002, 3/32" long
Bore diameter: 1.364 + .002, 1 27/32" long
Bore diameter: .490 + .002, 9/16" long
Finish 2 faces

Finish required — 40 to 60 micro-inches

Production — 15 pieces (complete) per hour at 100%



Rigid design plus experience-proven tooling and fixtures make this Bryant 998 Boring Machine ideal for precision boring, drilling, turning, facing, grooving and contour turning and boring. With it, you are assured of uniform fine finishes and repetitive accuracy . . . at peak production rates.

A precision cam and lever unit mechanically actuates the table. This feature provides positive, constant control of the cycle and eliminates variation due to temperature change of a hydraulic system.

Smooth, uniform table motion assures fine finishes. The table moves on two 4"-diameter solid steel slide bars and is supported by two anti-friction, pre-loaded ball bearings on each bar. This construction provides a metal-to-metal contact which eliminates shifting due to oil film. *Write for Bryant 998 Job Folder.*

BRYANT

chucking grinder co.

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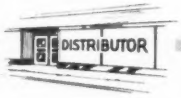
Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates

...for the best solution to your bearing problem

For quick replacement wherever and whenever a finished, ready-for-assembly highest quality bronze bearing is required, simply phone your local Bunting Distributor. Even extra ordinary requirements can be met from the vast assortment of finished Bunting bronze bearings in his comprehensive stocks.



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Your Bunting Distributor carries in stock for your money saving convenience completely machined and finished Bunting Standard Stock Industrial Bearings, Electric Motor Bearings and Precision Bronze Bars in a complete range of sizes, meeting all your usual production and maintenance needs. You will find him listed in the classified section of your telephone book—most likely under the heading Bars, Bronze or Bearings, Bronze. Your Bunting Distributor is an industrial distributor or a specialist in certain industrial items. He has been especially selected for his responsibility and his understanding of bearing requirements. Ask him for the Bunting Catalog or write.

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BRANCHES IN PRINCIPAL CITIES

C-D Product Directory

CYLINDERS, Air

Hannifin Corp., 501 Wolf Rd., Des Plaines, Ill.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Tomkins-Johnson Co., Jackson, Mich.

CYLINDERS, Hydraulic

Barnes, John S., Corp., Rockford, Ill.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg., Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Hydro-Line Mfg. Co., 5764 Pike Rd., Rockford, Ill.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Logansport Machine Co. Inc., 810 Center Ave., Logansport, Ind.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kiswaukee St., Rockford, Ill.
Tomkins-Johnson Co., Jackson, Mich.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

CYLINDERS, Pneumatic

Hydro-Line Mfg. Co., 5764 Pike Rd., Rockford, Ill.

DEALERS, Machinery

Falk Machinery Co., 18 Ward St., Rochester, N. Y.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.

DEMAGNETIZERS

Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Heald Mch. Co., 10 New Bond St., Worcester 6, Mass.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Inc., Worcester, Mass.

DESIGNERS, Machine and Tool

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Hartford Specialty Mchry. Co., 287 Homestead St., Hartford, Conn.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DIAMONDS AND DIAMOND TOOLS

Christensen Diamond Prod., 1937 S. Second West, Salt Lake City, Utah
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

DIE-CASTING

See Castings, Die.

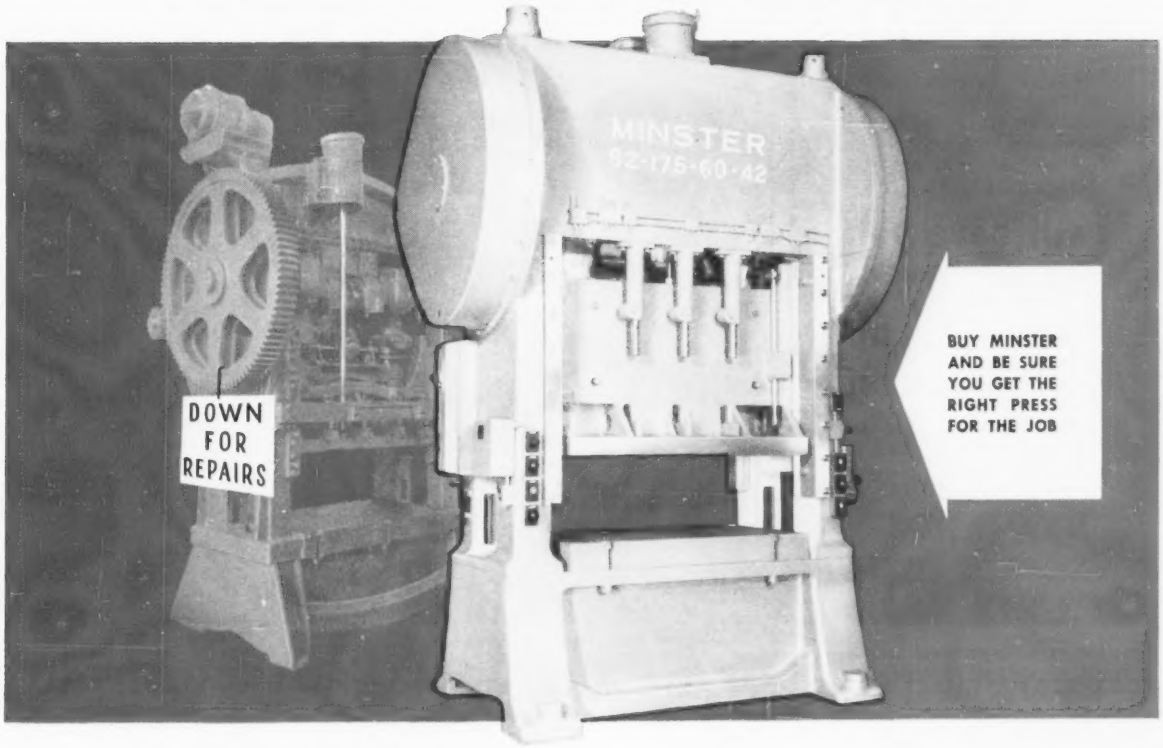
DIE-CASTING MACHINES

Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.
Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.

(*Continued on page* 308)

For more information on products advertised, use Inquiry Card, page 241

A Minster Press means
LESS DOWNTIME



Here is why Minster Presses on the job mean more production hours and less downtime for press repair!

1 ADVANCED DESIGN to give you the value of the best practices and latest improvements in presses . . . Box type construction for less deflection and better bearing support . . . Slides having longer ways fully supported and widely spaced . . . Large diameter connection screws . . . Method of taking up wear in lower connection bushings . . . Barrel slide adjustment on all sizes over 60 ton.
Clutch controls, both air and electrical, to improve press operation and production methods.

2 MINSTER'S PATENTED COMBINATION FRICTION CLUTCH AND BRAKE . . . One single automatically synchronized unit having air engaged multiple disc clutch and spring applied brake . . . Fast controlled engagement or disengagement at any point on 360° surfaces . . . Shock absorbing action . . . Exceptional friction surface life. *No more sledge hammer engagement, fast wearing and hard to fit replacement parts.*

3 PRECISION FITTING where it counts . . . Ways scraped to master gauges and square to the slide face . . . Bed scraped to surface plate . . . Bearing bores and bushings honed to fit . . . Ground spacers for maintaining proper gib clearance . . . Ground and roll burnished crankshafts.

4 MAINTENANCE INFORMATION AND OPERATOR INSTRUCTION applying to your press . . . A guide to preventive maintenance and operator training.

Let Minster help you plan your press replacement program

THE MINSTER MACHINE COMPANY

MINSTER, OHIO

MINSTER®

PRESSES

For more information on products advertised, use Inquiry Card, page 241

You can be sure

you're planning your production properly if you've considered the advantages of

Marblette Plastic Tooling Resins

which can speed designs from drawing board to production run, require no heavy equipment investment or highly skilled labor, facilitate pilot runs and design changes, and

will save you up to 70% in time and up to 80% in cost

in making stretch dies, draw dies and panels, match dies, jigs, fixtures, patterns, models, prototypes, core boxes, plating shields, bag and contact molds, latex dip production forms, molds for fibrous glass lay-up, spray-metal backing, vacuum-forming, and electro-forming, and other types of tools and dies.

The versatile yet specialized liquid epoxy and phenolic resins developed by Marblette fit into your production picture. Convince yourself—see how they can give you increased economy and efficiency—use the handy coupon below for resin samples, technical data, a phenolic data folder, an epoxy data folder, and a conversion computer that shows at a glance how much resin to use for casting any size product or part.

Marblette

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- ☐ Phenolic Data Folder
- ☐ Epoxy Data Folder
- ☐ Conversion Computer

Name .....

Title .....

Company .....

Address .....

DIE CUSHIONS
Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Clearing Mch. Corp., Div. U. S. Industries, Inc. 6499 W. 65th St., Chicago, Ill.
Verson Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.

DIE INSERTS, Carbide
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Kennametal Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

DIEMAKERS' SUPPLIES
Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DIEMAKING MACHINES
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Grob, Inc., Grafton, Wis.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.
Oliver Instrument Co., 1410 E. Moumee St., Adrian, Mich.

DIE SETS, Standard
Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 N. 18th St., Ampere, N. J.
Wales-Strippet Corp., North Tonawanda, N. Y.

DIE-SINKING MACHINES
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Gorton, George, Machine Co., 1110 W. 13th St. Racine, Wis.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DIE-SINKING PRESSES
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Kearney & Trecker Corp., Milwaukee, Wis.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.

DIE STOCKS
See Stocks, Die

DIES, Sheet Metal, Etc.
Bliss, E. W., Co., 1375 Raff Rd., S. W. Canton, Ohio.
Carboloy Dept. General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chambersburg Engrg. Co., Chambersburg, Pa.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Dreis & Krupp Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Mch. Co., Bridgeton, N. J.
Metal Carbides Corp., Youngstown, Ohio.
Niagara Mch. & Tool Wks. 683 Northland Ave., Buffalo, N. Y.
Richard Bros., Div., Allied Products Corp., 12619 Burt Rd., Detroit 23, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Verson Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.
Wales-Strippet Corp., North Tonawanda, N. Y.
Waltham Mch. Wks., Newton St., Waltham, Mass.

DIES, Threading
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg., Mansfield, Mass.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
Eastern Mch. Screw Corp., New Haven, Conn.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.
Threadwell Tap & Die Co., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.

DIES, Threading, Opening
Eastern Mch. Screw Corp., New Haven, Conn.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Geometric Tool Co., Westville Station, New Haven 45, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.

DIES, Thread Rolling
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.

DISCS, Abrasives
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Norton Co., 1 New Bond St., Worcester, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.
Smit, J. K. & Sons, Inc., Murray Hill, N. J.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

DISINTEGRATORS
Elox Corp., 602 N. Rochester Rd., Clawson, Mich.

DIVIDING HEADS
See Indexing and Spacing Equipment.

DOYELL PINS
Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Producto Machine Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DRESSERS, Grinding Wheel
Carboloy Dept., General Electric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32 Mich.
Metal Carbides Corp., Youngstown, Ohio.
Meyers, W. F. Co., Bedford, Ind.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Norton Co., 1 New Bond St., Worcester, Mass.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Vinco Corp., 9113 Schaefer Hwy., Detroit 28, Mich.

(*Continued on page* 312)

BIG PARTS—Sterling Engine Company checks surface finish on crankshafts, camshafts, milled surfaces, gear teeth, and other work with the SURFINDICATOR. It's portable and can be used right on the job!

"SURFINDICATOR—*Eliminates arguments on surface finish!*"

"ALTHOUGH IT IS DIFFICULT to estimate the savings made possible with gaging equipment," states Sterling Engine Company, "we have realized definite dollar savings with the Brush SURFINDICATOR* just through the elimination of arguments." Sterling uses the SURFINDICATOR to check finish on many precision parts where a microinch finish is specified.

The SURFINDICATOR speeds inspection, saves time, and can help *you* eliminate costly overfinishing. It can be set up easily for operation by shop personnel. Write for booklet—or ask for a demonstration of the SURFINDICATOR in your plant. Brush representatives are located throughout the United States. In Canada: A. C. Wickman, Ltd., Toronto.

*Trade Mark

SMALL PARTS—Chance Vought Aircraft, Inc. checks interior smoothness of fuel valve poppets used in the Cutlass jet fighter with the Brush SURFINDICATOR. Interior surfaces are measured with aid of small-bore pickup.

BRUSH ELECTRONICS COMPANY

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☐ Please send free copy of "Surface Finish Control."
☐ Have your nearest representative demonstrate the SURFINDICATOR to me.

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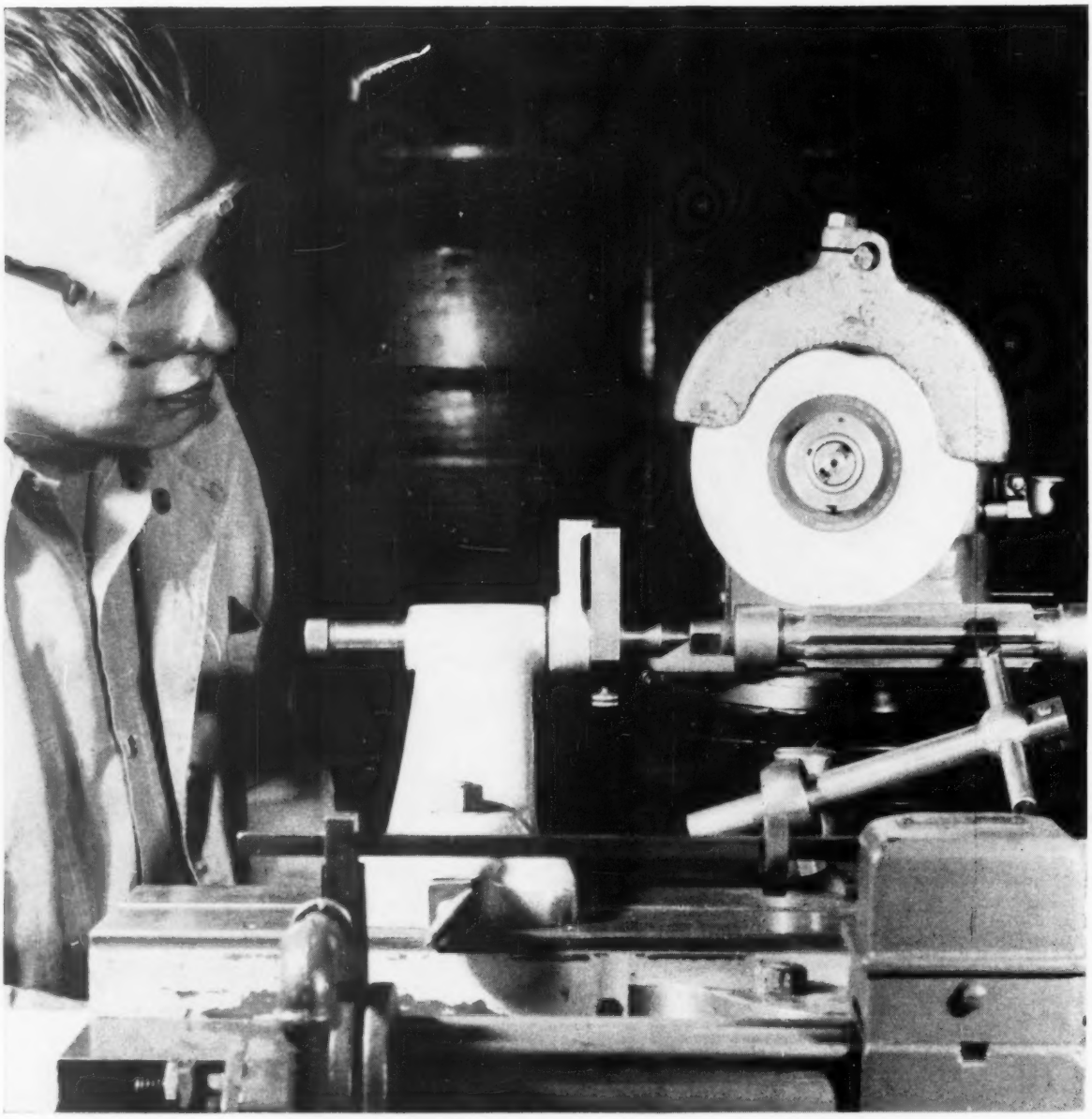
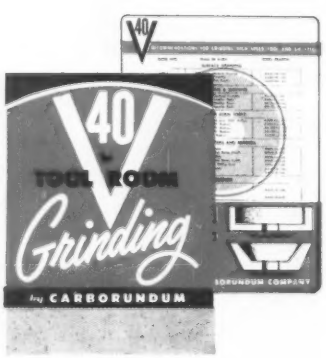
Position _____
Company _____
Address _____
City _____ *State* _____



From start to finish with **ONE** *set-up...*



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FREE FOLDER AND WALL CHART! Gives recommended V40 wheel gradings for grinding high speed tool and die steels. Write The Carborundum Company, Dept. M 81-56, Niagara Falls, N. Y. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ont.

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use **V40** *bond* **TOOL ROOM WHEELS**

HOLDS FORM, YET EASY TO DRESS! Here's the tool room wheel that does *more work* more of the time than any other wheel you can use. The superior form-holding ability of **V40** eliminates costly stops for wheel dressing and re-setting-up halfway through a job. Yet...when dressing between jobs, the special vitrified bond composition permits faster, easier dressing—with substantial savings in diamonds, time and abrasive.

COOLER, FASTER CUTTING! **V40** Bond Wheels cut exceptionally cool and free, even on high speed steels and hi-vanadium types. They are available in every type of wheel (straight, recessed, straight cup, flaring cup, dish, saucer) for every tool room grinding operation.

EASY TO IDENTIFY, EASY TO ORDER! Pure white aluminum oxide grain and the bright red blotter give **V40** wheels a distinctive appearance. They're easy to order, too...you can usually specify **V40** Bond Wheels in the same grit and grade as wheels you are now using.

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REGISTERED TRADE MARK

...continually putting more **SENSE** *in your abrasive* **DOLLAR**

DRIFTS, DRILL

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILL HEADS, Multiple Spindle

Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Buffalo Forge Co., 400 Broadway, Buffalo, N. Y.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 4, Pa.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Etto Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, Mich.
Gavro-Nelson Co., Detroit 8, Mich.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Snyder Tool & Engrg. Co., 3400 Lafayette, Detroit 7, Mich.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.
United States Drill Head Co., 616 Burns, Cincinnati, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILL HEADS, Unit Type

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Keller Tool Co., Grand Haven, Mich.
Kingsbury Mch. Tool Corp., Keene, N. H.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Morris Machine Tool Co., Inc., 946-H Harriet St., Cincinnati 3, Ohio.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

DRILL SOCKETS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Cleveland Twist Drill Co., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILL STANDS

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILL STOPS

Wohlnip Engineering Co., 390 Hillside Ave., Hillside, N. J.

DRILLING MACHINES, Automatic

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros. Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bodine Corp., Mt. Grove St., Bridgeport, Conn.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Consolidated Mch. Tool Corp., Rochester, N.Y.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Kingsbury Mch. Tool Corp., Keene, N. H.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Morris Machine Tool Co., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Wales-Strippet Corp., North Tonawanda, N. Y.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILLING MACHINES, Bench

Avey Drilling Mch Co., 126 E. Third St., Covington, Ky.
Buffalo Forge Co., 490 Broadway, Buffalo.
Conedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Cortland, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

DRILLING MACHINES, BOILER

Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland.

DRILLING MACHINES, Deep Hole

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
National Automatic Tool Co., Inc., S. 7th and N. St., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Wales-Strippet Corp., North Tonawanda, N. Y.

DRILLING MACHINES, Gang

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Consolidated Mch. Tool Corp., Rochester, N.Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Cortland, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Leland-Gifford Co., 1025 Southbridge St., Worcester Mass.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

DRILLING MACHINES, Horiz.

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Edlund Machinery Co., Cortland, N. Y.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Kaukauna Mch. Corp., Kaukauna, Wis.
Kingsbury Mch. Tool Corp., Keene, N. H.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

DRILLING MACHINES, Horizontal Portable

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Kaukauna Mch. Corp., Kaukauna, Wis.

DRILLING MACHINES, Inverted

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

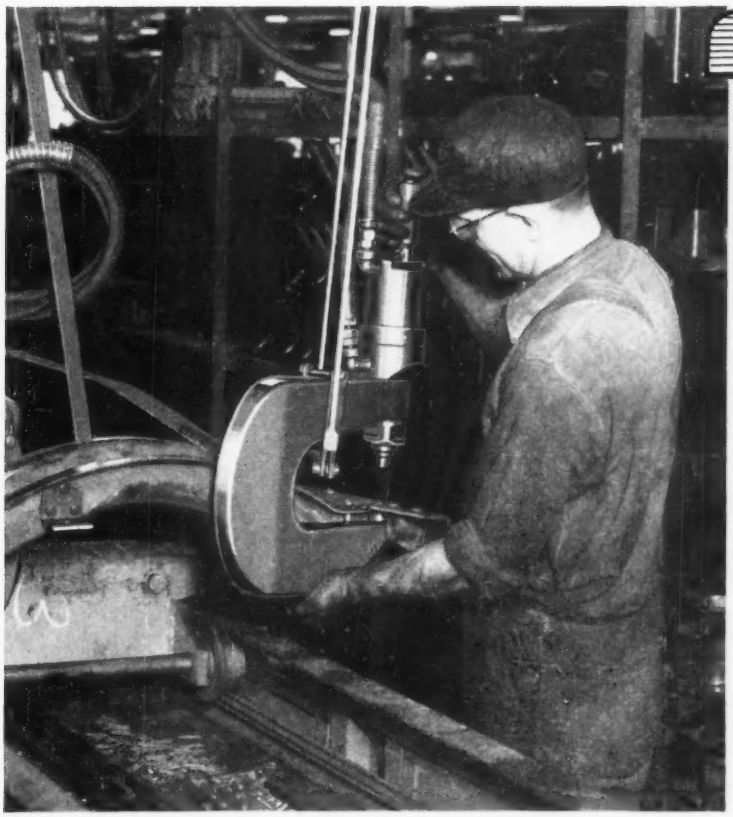
DRILLING MACHINES, Multiple Center Column Type

Avey Drilling Mch., Co., 26 E. Third St., Covington, Ky.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.

DRILLING MACHINES, Multiple Spindle

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St. Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Cortland, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Greenlee Bros. & Co., 12th and Columbia Ave., Rockford, Ill.
Hartford Special Mchry, Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit, Mich.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

(*Continued on page* 314)



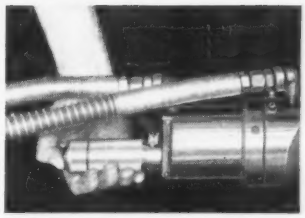
ACTION PICTURE
of how to save money by riveting!

This action photo, taken on the frame assembly line in one of the largest auto factories, illustrates how cost-conscious manufacturers save money with Hannifin "Hy-Power" Hydraulic Riveters.

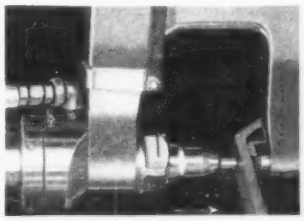
First step in assembly is to rivet the frame together...with Hannifin "Hy-Power" Riveters. The light-weight forged C-Frames hang from balancers within easy reach of each operator. No special skill is required to head the ⅜" rivets, cold, each in seconds. What's more, this "silent squeeze" method forms stronger, more uniform rivets, hot or cold.

Power source is the Hannifin "Hy-Power" Hydraulic Pressure Generator which quietly supplies pressure to the "Hy-Power" Cylinder that does the work. These riveters are available in 7½, 10, 12½, 17½, 25, 35, 50, 75 and 100-ton capacities.

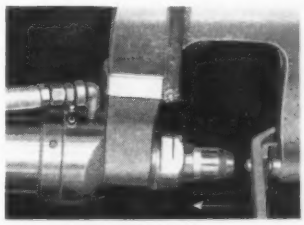
here's the HANNIFIN "HY-POWER" WORK CYCLE



In position. A single control button starts (or interrupts) the automatic Hy-Power cycle.



Ram approaches fast, then hydraulic pressure automatically intensifies, and the rivet head is formed.



Fast, automatic return. Total elapsed time to head a rivet is only 2 to 3 seconds.

"HY-POWER" CAN ALSO BE USED IN MULTIPLE TO SET SEVERAL RIVETS

Bulletin 150 tells how to save money on riveting, staking, punching, forming and bending operations. Write for copy.

do ALL you can do...with

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Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves

For more information on products advertised, use Inquiry Card, page 241

DRILLING MACHINES, Radial
American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Carlton Mch. Tool Co., 3000 Spring Grove Ave., Cincinnati 25, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Kaukauna Machine Corp. (Universal), Kaukauna, Wis.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

DRILLING MACHINES, Rail
See Drilling Machines, Gang

DRILLING MACHINES, Sensitive
Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Cortland, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland, 8, Ohio.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
National Automatic Tool Co., Inc., S. 7th and N. St., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Wales-Strippet Corp., North Tonawanda, N. Y.

DRILLING MACHINES, Upright
Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Mch. Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Cortland, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Moline Tool Co., 102 20th St., Moline, Ill.
National Automatic Tool Co., Inc., S. 7th nad N. Sts., Richmond, Ind.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Wales-Strippet Corp., North Tonawanda, N. Y.

DRILLING MACHINES, Wall, Radial
Cleveland Punch & Shear Works, 3817 St. Clair Ave., N.E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.

DRILLS Center
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Keo Cutters, 19326 Woodward, Detroit, Mich.
National Twist Drill & Tool Co., Rochester, Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Core
Corboloy Dept., General Elecric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
National Twist Drill & Tool Co., Rochester, Mich.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

DRILLS, Deep Hole
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Portable Electric
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Millers Falls Co., Greenfield, Mass.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

DRILLS, Portable Pneumatic
Chicago Pneumatic Tool Co., 6 E. 44th St., New York 9, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

DRILLS, Rachet
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Spade
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.

DRILLS, Twist
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Wire
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRIVES, Chain
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.

DUPLICATORS
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Rockford Mch. Tool Co., 2500 Kishwaukee St. Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DUST COLLECTORS
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Pangborn Corp., Hagerstown, Md.

DUST CONTROL SYSTEMS
Pangborn Corp., Hagerstown, Md.

ELECTRICAL EQUIPMENT
General Electric Co., Schenectady 5, N. Y.

EMERY WHEEL DRESSERS
See Dressers, Grinding Wheel

EMERY WHEELS
See Grinding Wheels

ENGRAVING MACHINES
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.

EXTRACTORS, Drill
Wohlnip Engineering Co., 390 Hillside Ave., Hillside, N. J.

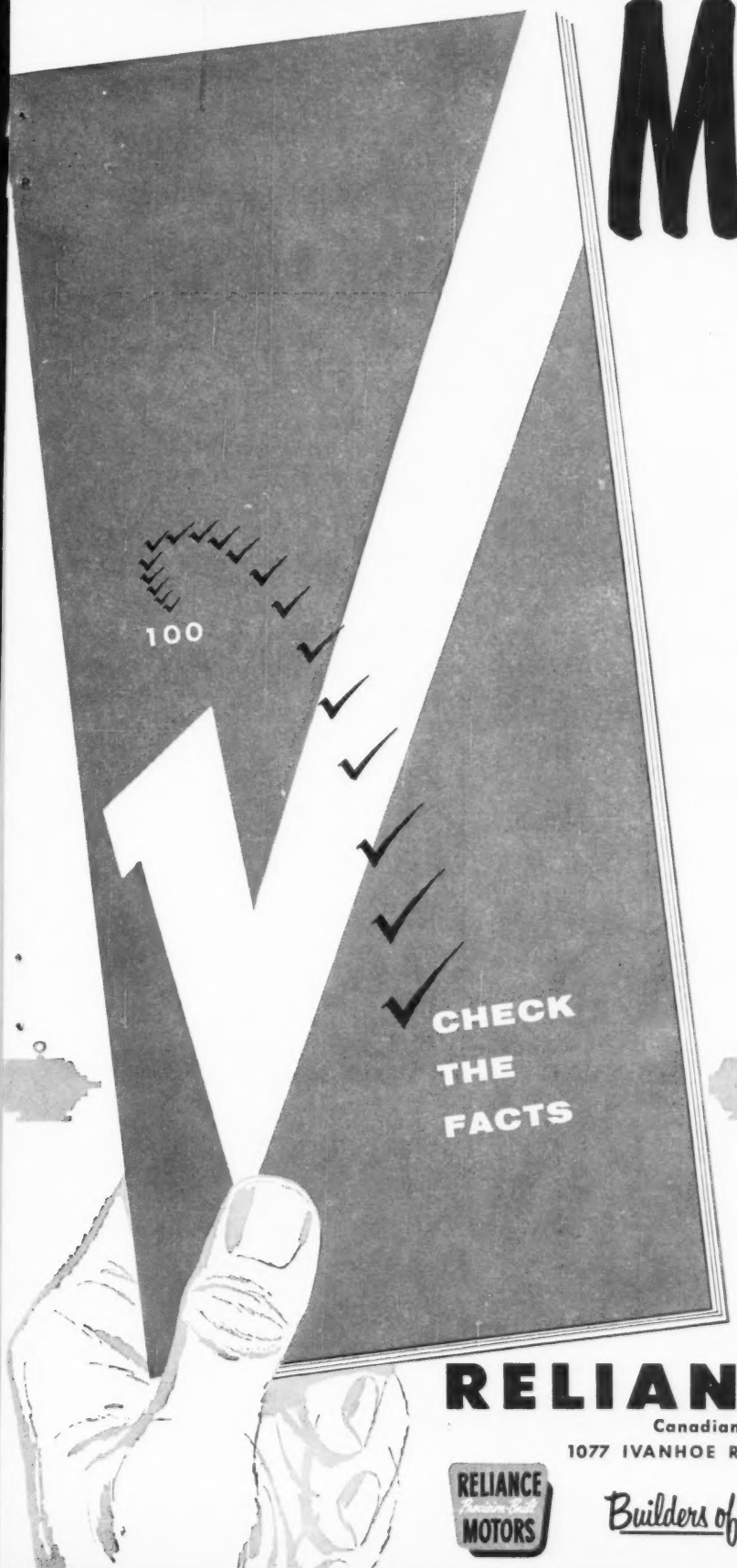
EXTRACTORS, Screw
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

(*Continued on page* 316)

NEW

TOTALLY PROTECTED A-C.

MOTORS



Yes, it's true!

Industry everywhere is checking into the facts about these amazing new *Totally* Protected A-c. Motors by Reliance.

To help *you* check the facts to see where it fits into *your* production area, we've prepared a booklet called "Check the Facts".

Get your copy today—by mail, or through your local Reliance district sales office or distributor.

B-1489

RELIANCE ELECTRIC AND ENGINEERING CO.

Canadian Division: Welland, Ontario

1077 IVANHOE ROAD • CLEVELAND 10, OHIO

RELIANCE MOTORS

Builders of the Tools of Automation

RELIANCE V-S DRIVE

FACING MACHINES
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.

FANS, Exhaust, Electric Ventilating
Buffalo Forge Co., 490 Broadway, Buffalo N. Y.
General Electric Co., Schenectady 5, N. Y.

FEEDS FOR PRESSES, Automatic
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

FELT, For All Applications
American Felt Co., Glenville, Conn.

FILES, Hack
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

FILES, Hand
Atkins Saw Div., Borg-Warner Corp., 402 S. Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Heller Bros. Co., Newcomerstown, Ohio.
Nicholson File Co., 23 Acorn St., Providence, R. I.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

FILES, Machine
Atkins Saw Div., Borg-Warner Corp., 402 S. Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILES AND BURS, Rotary
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

FILING MACHINES, Dies, Etc.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILTERS, Air
Keller Tool Co., Grand Haven, Mich.

FILTERS, Coolant and Oil
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Industrial Filtration Co. (Delpark Corp.) 15 Industrial Ave., Lebanon, Ind.

FINISHES FOR MACHINES AND METAL PARTS
Lowe Bros. Co., Dayton, Ohio.
Parker Rust Proof Co., 2194 E. Milwaukee, Detroit 11, Mich.
Ransburg Electro-Coating Corp., 1234 Barth, Indianapolis, Ind.

FLEXIBLE COUPLINGS
See Couplings, Flexible

FLEXIBLE SHAFT EQUIPMENT
Pratt & Whitney, West Hartford 1, Conn.

FORGINGS, Machines (Upsetting)
Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

FORGINGS, Drop
Bethlehem Steel Co., Bethlehem, Pa.
Mueller Brass Co., Port Huron 35, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

FORGINGS, Hollow Bored
Bethlehem Steel Co., Bethlehem, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.

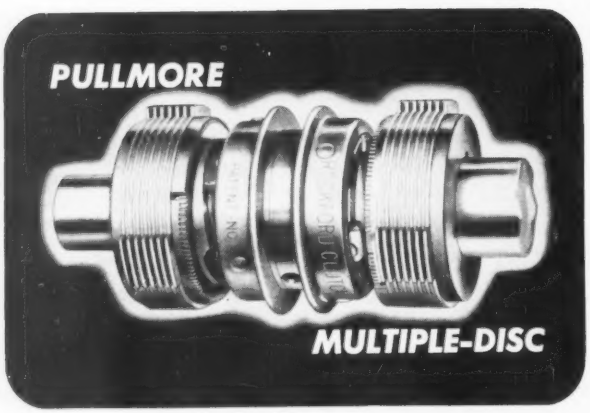
FORGINGS, Iron and Steel
Bethlehem Steel Co., Bethlehem, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Upset
Bethlehem Steel Co., Bethlehem, Pa.
Mueller Brass Co., Port Huron 35, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

FORMING AND BENDING MACHINES
American Steel Foundries, Elmes Engrg. Div., Paddock Rd., and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.

(*Continued on page* 318)

ROCKFORD



HIGH TORQUE LOW ENGAGING PRESSURE

COMPACT DESIGN
HIGH TORQUE
HIGH-RATIO LEVERS
POSITIVE NEUTRAL
PRECISION BUILT
LONG WEAR LIFE
EASY ADJUSTMENT

* PULLMORE discs provide high capacity and efficient lever design enables light engaging pressure. Discs are accurately made from special clutch-disc materials and are tested for flatness. Made in single and double types, for operation in oil or dry, PULLMORE clutches have capacities from 1 to 90 H.P. at 500 R.P.M. They handle loads of much greater than rated capacity, when operated at higher speeds.

Send for This Handy Bulletin

Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications.

Furnishes capacity tables, dimensions and complete specifications.

ROCKFORD CLUTCH DIVISION BORG-WARNER
▲ 410 Catherine Street, Rockford, Illinois, U.S.A. ▲

CLUTCHES

For more information on products advertised, use Inquiry Card, page 241

Why you can buy Heller Brothers files *only from your* distributor!

GIVES PERSONALIZED SERVICE

Your Distributor keeps informed about new applications so that he can advise you on new types of files and their uses. He also suggests methods of proper care. He always has the Heller Brothers' representative and engineering services available to serve you.

HAS QUICK DELIVERIES

He maintains a full stock and warehouses countless items that would otherwise tie up your capital.

HAS COMPLETE "FOLLOW-THROUGH"

He keeps you informed on deliveries, follows-up to meet your emergency needs, answers intelligently your questions. You're never "in the dark" with your Distributor.

YOU CAN DEPEND ON HIM

You can get the exact Heller file you need for the job. Heller makes all American Pattern files, Swiss Pattern files, Vixen Milled Curved-Tooth files, Rotary files, Carbide Burrs, Center Laps, Internal Grinding Burrs and Counter Sinks. You can be sure he has the complete support and cooperation of *America's oldest file manufacturer.*

VIXEN
American-Swiss
NUCUT

THESE 3 FAMOUS FILES ARE MADE ONLY BY HELLER

HELLER BROTHERS SINCE 1836 TRADE MARK

HELLER BROTHERS CO. *America's Oldest File Manufacturer* **NEWCOMERSTOWN, OHIO**

A New Jersey Corporation

Branch Offices in New York, Detroit and Chicago

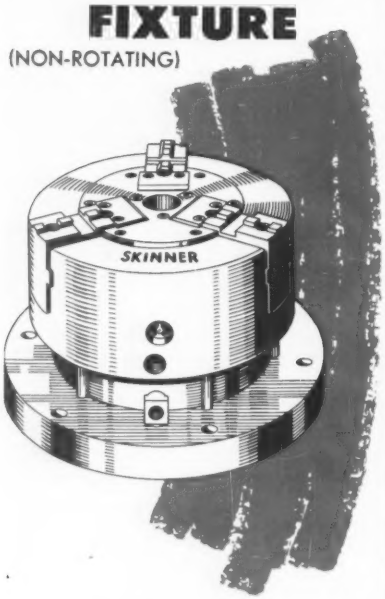
YOUR *HELLER* DISTRIBUTOR CAN SUPPLY ALL YOUR FILE NEEDS

NEW

SKINNER

POWER CHUCK FIXTURE

(NON-ROTATING)



POWERFUL!
ACCURATE!
FAST! DURABLE!

Close coupling makes this Skinner Power Chuck Fixture the lowest, most compact unit of its type! Air-operated, it can be used on drilling, milling and transfer machines, and for assembly operations.

Special wedge action provides tremendous gripping power. Self-centering, self-locking. Available in 8″, 10″ or 12″ dia., with 2 or 3 jaws. Operable with either a Skinner hand valve or a 4-way solenoid or foot valve. ⅜″ pipe connections. Maximum air pressure: 100 lbs.

Write for Bulletin PCF 67

THE CREST SKINNER CHUCKS® OF QUALITY

THE SKINNER CHUCK COMPANY

206 Edgewood Avenue, New Britain, Conn.

Erie Foundry Co., Erie, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Yoder Co., 5500 Walworth, Cleveland, Ohio.

FORMING AND STAMPING MACHINES

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

FORMING TOOLS or Tool Blanks

Brown & Sharpe Mfg. Co., Providence, R. I.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

FRAMES, Machinery Welded

Mahon, R. H. Co., Detroit 34, Mich.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

FURNACES, Heat-Treating

General Electric Co., Schenectady 5, N. Y.

FURNITURE, Shop

Standard Pressed Steel Co., Jenkintown, Pa.

GAGE BLOCKS

Brown & Sharpe Mfg. Co., Providence, R. I.
Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

GAGES, Air

Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Comparator

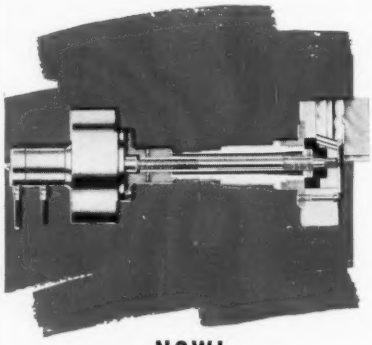
Ames, B. C., Co., Waltham 54, Mass.
Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.
Comtor Co., 47 Farwell St., Waltham 54, Mass.
Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

(*Continued on page 322*)

NEW

SKINNER

"JUNIOR" POWER CHUCKING UNIT



NOW!
Maximum production speed for your small lathes TOO!

This Skinner "Junior" unit can be adapted to almost any small lathe with 1″ to 1⅜″ hole through the spindle. It is light in weight, precisely balanced to minimize spindle bearing and braking loads, and provides extreme repetitive accuracy on internal and external work.

The Skinner 8″ self-centering power chuck has gripping capacity from ¼″ to 6″. Its ¼″ jaw travel exceeds the capacity of any collet, and is particularly valuable on production work where rough or finished holding diameters may vary beyond a single collet's ability to grip.

The Skinner "Junior" unit is complete. It contains chuck, 6″ aluminum air cylinder, adapters, draw bar, etc.

Write Skinner or your nearest Skinner distributor for illustrated folder.

THE CREST SKINNER CHUCKS® OF QUALITY

THE SKINNER CHUCK COMPANY

206 Edgewood Avenue, New Britain, Conn.

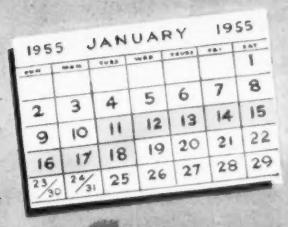
For more information on products advertised, use Inquiry Card, page 241

BREAKDOWN?

Cut DOWNTIME

and keep out of the "RED"

from this



JAN. 11 — 9:00 A.M. — Gear failed, machine stopped.

JAN. 11 — 10:00 A.M. — Letter mailed ordering custom gear from manufacturer.

JAN. 18 — 1:00 P.M. — Replacement gear delivered.

JAN. 18 — 2:00 P.M. — Machine back in operation.

DOWNTIME = *8 days*

to this

JAN. 11 — 9:00 A.M. — Gear failed, machine stopped.

JAN. 11 — 9:10 A.M. — Phone call to local Distributor ordering standardized BOSTON Gear replacement from shelf stock.

JAN. 11 — 10:00 A.M. — Replacement gear delivered.

JAN. 11 — 11:00 A.M. — Machine back in operation.

DOWNTIME = *2 hrs.*

— use

BOSTON Gear

Standardized, interchangeable BOSTON Gear products are available promptly anywhere from nearby Distributor's stock . . .

Design this time-saving, money-saving advantage into the products and equipment you make . . . let it simplify your maintenance. Specify BOSTON Gear . . . industry's standard of quality for 76 years . . . first choice of over 250,000 cost-wise buyers. Boston Gear Works, 65 Hayward St., Quincy, Mass.

STANDARDIZED STOCK TRANSMISSION PRODUCTS

7124 "OFF-THE-SHELF" PRODUCTS 96 DISTRIBUTORS WITH LOCAL STOCKS

Ask for your Copy

The Screw Machine You've Been Waiting for . . .

Dealers Now Demonstrating—Orders Now Being Taken

A really different, completely new single spindle automatic screw machine is now ready to go to work for you.

The way it lowers costs and increases production has made it the most talked about screw machine development in 20 years.

In actual production runs on parts of every degree of precision and complexity the Detroit Screwmatic 750 has set records never before possible.

Now It Can Be Shown. Machines for demonstrations are now being shown at our dealers.

Orders Now Being Taken. Your dealer is prepared to quote you prices and delivery dates. Prints of your work will be rapidly processed.

See It To Believe It . . . to believe that during a cycle you can employ three different spindle speeds, all of which may be reversed . . . believe that speeds are infinitely variable and simply controlled by setting the dials . . . believe that the spindle is driven by silent endless V-belts . . . believe that low pressure air-cylinders can do the work of a constant speed backshaft!

These are just a few of the many features that extend the horizons of your screw machine production . . .

- Greater precision through chatterproof, accurate forming.
- Simplified tool and cam layout—fully visible lead cam and six-station turret.
- Outstanding work-length capacity – a turret slide unit, including the lead cam and drive, mounted longitudinally, slides along the machine base. The unit can be positioned away from the spindle so as to permit work pieces up to 6 inches in length to be machined with turret tools.
- Maximum tool accessibility through open front design.
- Large chip well provides free chip flow.
- Standard tool and attachment accommodations.

You'll like to deal with us. You'll like our way of servicing customers. And you'll be dealing with a company known for its accomplishments in precision, speed, and automation in the field of gear grinding . . . a company that produces the intricate Rzeppa Constant Velocity Universal Joints.

WRITE TODAY FOR NAME OF DEALER NEAREST YOU.

DETROIT Screwmatic 750

A product of

THE GEAR GRINDING MACHINE CO.

3921 Christopher • Detroit 11, Michigan

For more information on products advertised, use Inquiry Card, page 241

DETROIT Screw Matic 750

WORK SPINDLE
Driven by independently supported V-belts and sheave.

TURRET SLIDE
Equipped with a three-position crank setting to adjust turret unit away from the spindle.

ATTACHMENT MOUNTING FACE

TURRET LEAD CAM
Readily mountable and always visible.

OVERLOAD SAFETY DEVICE
Readily accessible position and easy to reset.

SPINDLE SPEED
Infinitely variable and reversible. Controlled by simple dial setting. Three preset, independent cutting speeds are conveniently adjustable during cutting.

CROSS SLIDES
Direct cam operated.

PARTS RECEIVER

OPEN FRONT DESIGN
Provides unrestricted room for turret tools and chip flow space.

HANDY WINDING FACILITY
Constant ratio.

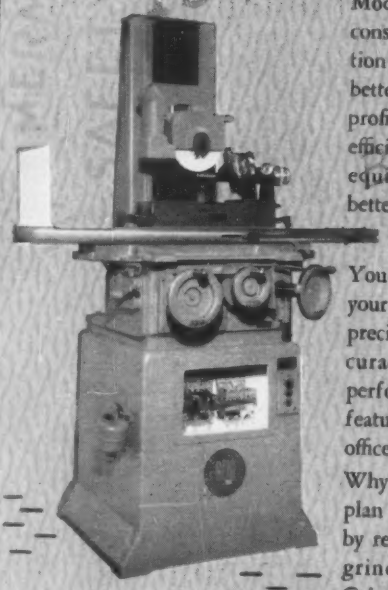
TURRET AND CAMSHAFT UNIT
Self-contained and slideable along machine bed.

MACHINE BASE
Sturdy, one-piece, rigid cabinet. High walls give protection against oil spillage.

PATENTED & PATENTS PENDING

don't overlook dividends

THAT YOU CAN FIND RIGHT IN YOUR TOOLROOM



Modern dividend-paying companies constantly search for better production methods to capture bigger and better markets. The heart of more profitable production lies in modern, efficient toolroom techniques and equipment to provide tools for better and faster production.

You can find dividends right in your toolroom when you use Reid precision surface grinders — accuracy, convenience, dependable performance — yes, and many more features that translate into front office dividends.

Why not sit down right now and plan your share of these dividends by replacement of *all* your over-age grinders with new Reid Surface Grinders.

CONDENSED SPECIFICATIONS — Model 618V
Capacity: 6" x 18" x 17¼"
Work table: 51" x 8"
Power Feed: variable, 12 to 35 ft/min

Facts that mean money in your pocket are contained in our latest Bulletin 618-2 write for your copy today.

Reid Brothers Company, Inc.
BEVERLY, MASSACHUSETTS

GAGES, Depth

Ames, B. C., Co., (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Hanson-Whitney Co., Div., Whitney Chain Co., Hartford, Conn.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Dial

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Electric

Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.

GAGES, Height

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.

GAGES, Plug, Ring and Snap

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co. Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Vinco Corp., 9113 Schaefer Hwy., Detroit 28, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

GAGES, Surface

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Starrett, The L. S., Co., Athol, Mass.

(*Continued on page* 324)

For more information on products advertised, use Inquiry Card, page 241

in the gear industry, it's

UNION

UNION DISTRIBUTORS

SERVE THE NATION

FOR
- SPEED
- ECONOMY
- RELIABILITY
- PERSONAL CONTACT

CALL YOUR UNION DISTRIBUTOR.

UNION TWIST DRILL COMPANY • ATHOL, MASSACHUSETTS

OWNERS AND OPERATORS OF: S. W. CARD MANUFACTURING CO. DIVISION, Mansfield, Mass.
BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Quebec

GAGES, Taper

Brown & Sharpe Mfg. Co., Providence, R. I.
Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Thread

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GASKETS

Crane Packing Co., 1800 Cuyler Ave., Chicago.
Garlock Packing Co., Palmyra, N. Y.

GEAR BLANKS, Non-Metallic

Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
Chicago Rawhide Mfg. Co., 1309 Elston Ave., Chicago, Ill.
General Electric Co., Schenectady 5, N. Y.

GEAR BURNISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.

GEAR CHAMFERING, ROUNDING AND BURRING MACHINES

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Modern Industrial Engrg. Co., 14230 Birwood, Detroit 4, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

GEAR CHECKING INSTRUMENTS AND EQUIPMENT

Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vinco Corp., 9113 Schaefer Highway, Detroit 28, Mich.

GEAR CUTTING MACHINES, Bevel Gears (Generators)

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR CUTTING MACHINES Bevel Gears, Spiral

Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR CUTTING MACHINES, Spur and Bevel Gears (Rotary Cutter)

Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Waltham Machine Works, Newton St., Waltham, Mass.

GEAR CUTTING MACHINES, Spur and Helical Gears (Hobbing)

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

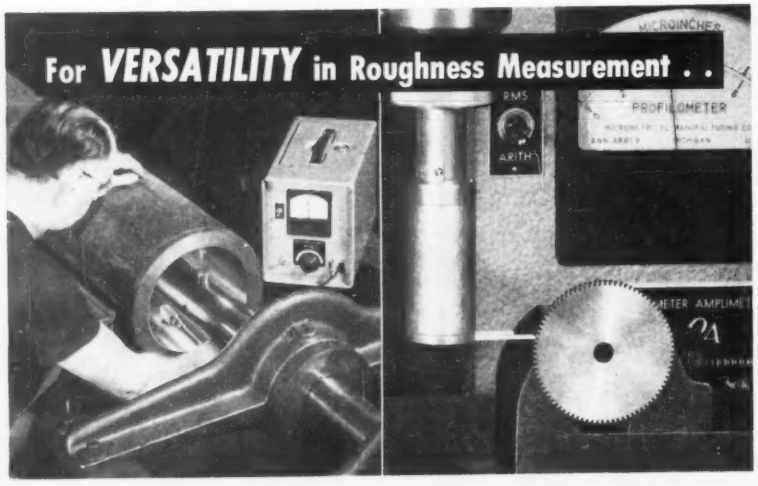
GEAR CUTTING MACHINES, Spur and Helical Gears (Shaper or Planer Type)

Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.

GEAR CUTTING MACHINES, Worm and Worm Wheels

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt. (Straight and Hourglass Types).
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

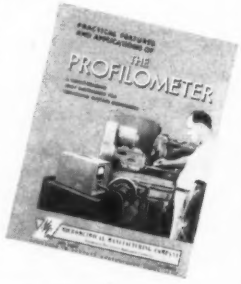
(*Continued on page* 326)



The PROFILOMETER®

With the Profilometer, you can quickly measure the microinch roughness of ID's of *any* size from 5/64" to flat — OD's of *any* size from 1/32" to flat, and from .010" to *several feet* in length — gear teeth as small as 48 D. P. — internal grooves and tapers — recessed shoulders — 1/2" holes to 24" depth — and practically *all other* surfaces, including surfaces of rotation.

The Profilometer is a shop tool — rugged, portable, and simple to use. Highly stable and factory-calibrated for dependability. Used world-wide, in thousands of production and inspection departments . . . since 1936.



FREE BULLETIN LT89 gives details — shows typical applications — tells 7 ways in which *you* may gain through surface roughness measurement. Write!

Profilometer is a registered trade mark.

MMCo
MICROMETRICAL
MANUFACTURING COMPANY
329 S. MAIN ST. ANN ARBOR, MICHIGAN

For more information on products advertised, use Inquiry Card, page 241

GEAR PROBLEMS SOLVED

By Illinois Gear—gear specialists of America!

Illinois Gear & Machine Company devotes *all* of its time, *all* of its resources, *all* of its abilities to just *one thing*—supplying you with the finest gears that are available!

Is your gear problem one of consistent quality—of delivery on time, *all* the time—of true economy through long and dependable service—if this is your problem—then call ILLINOIS GEAR.

Year in and year out, skilled craftsmen at Illinois Gear build gears for every purpose—from gears rotating massive hundred ton shovels to gears that control the tension on delicate tissue paper speeding at thousands of feet per minute. These skilled craftsmen are yours to command, and they have available all of the resources of the best equipped plants anywhere.

If you countenance absolutely no compromise with quality—solve your gear problems at Illinois Gear.

Look for this mark ILL . . . the symbol on finer gears

ILLINOIS GEARS
Reg. U.S. Pat. Off.

Gears for Every Purpose ... one gear or 10,000 or more

ILLINOIS GEAR & MACHINE COMPANY

2108 NORTH NATCHEZ AVENUE • CHICAGO 35, ILLINOIS

GEAR FINISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR GRINDING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17.
Gear Grinding Machine Co., 3901 Christopher St., Detroit 11, Mich.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., Springfield, Mass.

GEAR HARDENING MACHINES

Gleason Works, 1000 University Ave., Rochester 3, N. Y.

GEAR LAPPING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR MOTORS

See Speed Reducers.

GEAR SHAVING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR TESTING MACHINERY

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

FOR HIGH PRODUCTION
THREAD ROLLING MACHINES
ELCO
SCREWS
comes to
HARTFORD
Special
HARTFORD SPECIAL AUTOMATIC THREAD ROLLERS boost production with economy and accuracy. They feature easy set-up, automatic feed, vibration free operation, automatic lubrication.
Two models will thread lengths 1/8" to 2½", diameters from .086 through .250 at rates up to 150 pieces per minute.
New Bulletin TR-100 gives full details and specifications.
THE HARTFORD SPECIAL MACHINERY CO. - HARTFORD 12, CONN.

GEARS, Cut

Automotive Gear Works, Inc., Richmond, Ind.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
Chicago Rawhide Mfg. Co., 1309 Elston Ave., Chicago, Ill.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears Div., Michigan Tool Co., 7200 E. McNichols Rd., Detroit, Mich.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Fairfield Mfg. Co., 2309 S. Earl Ave., Lafayette, Ind.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Gear Specialties Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Illinois Gear & Mch. Co., 2120 No. Natchez Ave., Chicago 35, Ill.
Mass. Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Micron Gear Mfg. Co., 102-38 Corona Ave., Corona, N. Y.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 13, Mich.
New Jersey Gear Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Perkins Machine & Gear Co., West Springfield, Mass.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
Pittsburgh Gear Co., Neville Island, Pittsburgh 25, Pa.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GEARS, Rawhide and Non-Metallic

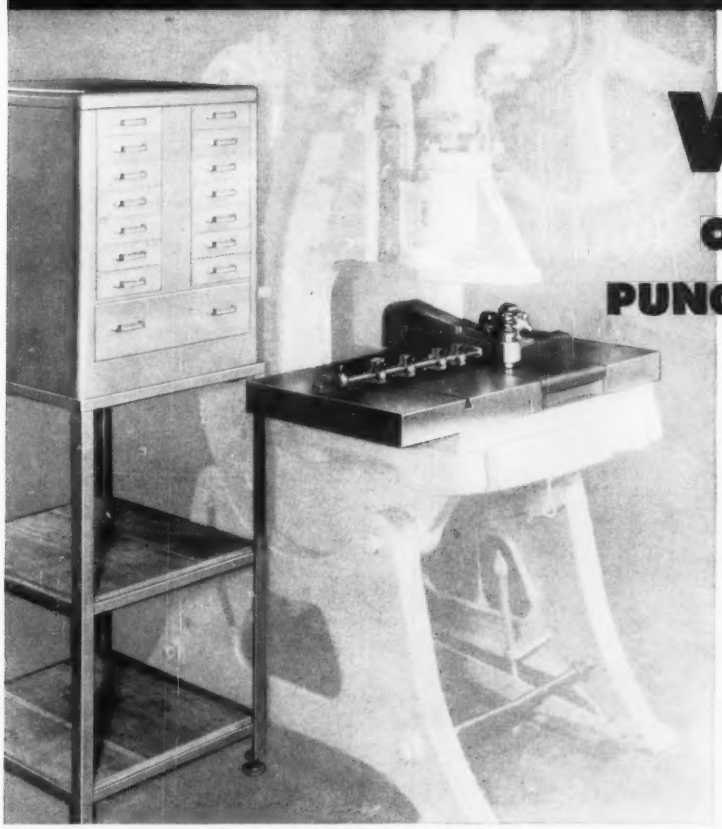
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
Chicago Rawhide Mfg. Co., 1309 Elston Ave., Chicago, Ill.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Gear Specialties Inc., 2635 W. Medill Ave., Chicago 47, Ill.

(*Continued on page 328*)

Announcing

WALES

QUICK-CHANGE PUNCHING & GAUGING ASSEMBLY



Converts presses into a versatile hole punching machine with **20 SECOND PUNCH AND DIE CHANGE**

● This new, self-contained press accessory pays for itself in a matter of a few months...in some cases in a matter of weeks by such unusual time saving advantages as changing punches and dies in 20 seconds. Holder keeps punch and die in permanent alignment. Built-in adjustable gauging provides a new, simple, fast, accurate method of locating the work.

Popularly known as the Wales "PPG Group", it consists of a bed plate, quick-change holder, 18″ back gauge bar, 18″ stop support rail and a combination punch storage cabinet and tool rack.

This is too BIG a story to tell in this space, so write for illustrated PPG Bulletin.

WALES-STRIPPIT CORPORATION

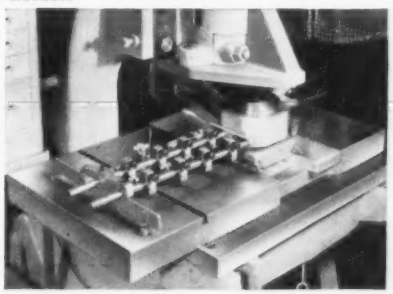
George F. Wales, Chairman

375 Payne Avenue, North Tonawanda, N. Y.

(Between Buffalo and Niagara Falls)

WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONTARIO

Showing how easily and quickly the punch and die is removed and replaced in the Wales Quick-Change Holder for punching holes up to 1¼″ in diameter. To remove the die, pull the holder forward and hit the punch head with hand which releases the ball-held die from bottom of holder. Punch assembly is merely lifted out of top of holder.



Showing Wales 3½″ Holder for punching holes up to 3½″ in diameter. This holder is not part of the "PPG Group" but is available as optional equipment.

For more information on products advertised, use Inquiry Card, page 241

Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
Pittsburgh Gear Co., Neville Island, Pittsburgh 25, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GENERATORS, Electric

General Electric Co., Schenectady 5, N. Y.
Lincoln Electric Co. (Arc), 22801 St. Clair Ave., Cleveland, Ohio.
Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.

GRADUATING MACHINES

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.

GREASE

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 129 Lockwood St., Newark 5, N. J.
Sinclair Refining Co., 600 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia.
Texas Co., 135 E. 42nd St., New York, N. Y.

GRINDERS, Carbide Tool

See Grinding Mches, Carbide Tool

GRINDERS, Die and Mold

Consolidated Mch. Tool Corp., Rochester, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

GRINDERS, Oilstone, for Woodworking Tools

Mummert-Dixon Co., Hanover, Pa.

GRINDERS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Conn.
Madison-Kipp Corp., Madison, Wis.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

GRINDERS, Portable Electric and Toolpost

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Millers Falls Co., Greenfield, Mass.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

GRINDING FIXTURES

Geometric Tool Co. (Die Chaser), Westville Station, New Haven 15, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GRINDING MACHINES, Abrasive Belt

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Mch. Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

GRINDING MACHINES, Bench

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Millers Falls Co., Greenfield, Mass.
Rivette Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
U. S. Burke Machine Tool Div., Brotherton Rd. 17, Cincinnati 27, Ohio.

GRINDING MACHINES, Broach

Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Lapointe Mch. Tool Co., 34 Tower St., Hudson, Mass.

GRINDING MACHINES, Camshaft

Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

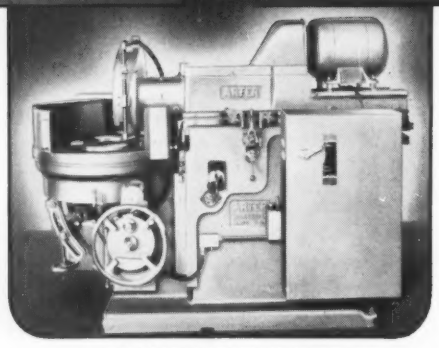
GRINDING MACHINES, Carbide Tool

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

(*Continued on page 330*)

The Arter Family of Machines

CARBIDE TOOL GRINDERS



CYLINDRICAL GRINDERS

INTERNAL GRINDERS

ROTARY SURFACE GRINDERS

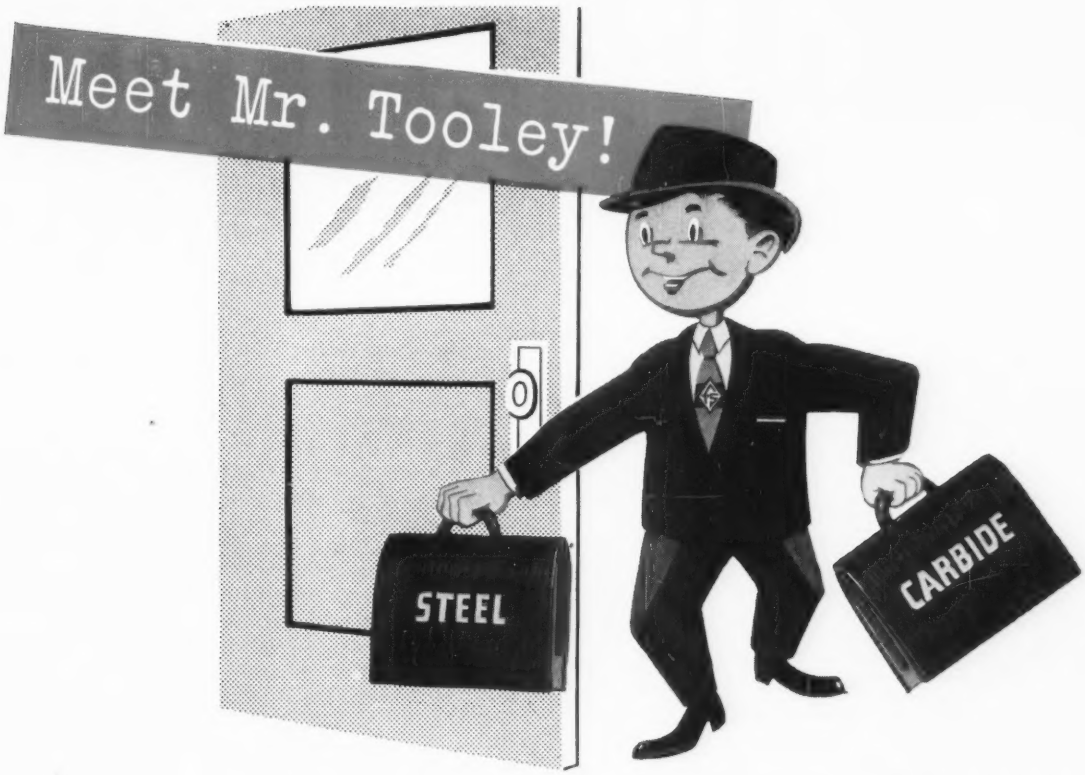
Chuck Capacity 8" to 40"

The Arter trademark on these machines is the sign of
ACCURACY • POWER • DEPENDABILITY.
Tell our engineers your grinding problems.
They'll find a way to lick them.

ARTER GRINDING MACHINE COMPANY
WORCESTER • MASSACHUSETTS

Agents in industrial centers of United States and Canada

For more information on products advertised, use Inquiry Card, page 241



AMERICA is a land of symbols. The things we use and eat and wear, the services rendered to us, are often better known by their symbols than by their generic product names.

From Sunny Jim of yesteryear, who put packaged cereal on America's breakfast table, to Reddy Kilowatt who dramatizes electricity . . . "trade" symbols and characters have become loved and respected as representing reliability, versatility and often uniqueness.

Our Mr. Tooley is such a *symbol* to all industry where tooling for production is so important that it may even mean the difference between profit and loss.

For Mr. Tooley typifies the *unique* position that Firth Sterling occupies among producers of tools and tooling materials . . . that of making and selling *both steels and carbides* . . . the *right* steel or carbide or the exact combination needed to do each job best . . . from a single manufacturing source.

Thus Mr. Tooley has taken his place among American trade characters symbolizing a service of *greater* value built on Firth Sterling's ability to make *unbiased* recommendations and capacity to furnish *complete* shop tooling needs.

Firth Sterling

—INC—

GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

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High Speed Steels
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NEW 48-PAGE CATALOG to help you select the RIGHT TOOLS and TOOLING MATERIALS

You'll find this catalog valuable in selecting proper machining materials: carbide standard tools, tips, inserts, blanks; steel toolholder bits, drill rod, ground flat stock. Get your copy from your Firth Sterling distributor or write direct.

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R-302

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Please send me the new 48-Page Firth Sterling Catalog.
I am particularly interested in: ☐ Steel ☐ Carbide

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Company_____
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City_____ Zone_____
State_____

For more information on products advertised, use Inquiry Card, page 241

Model PO Air-Actuated CLUTCHES

provide

REMOTE CONTROL without complicated linkage.

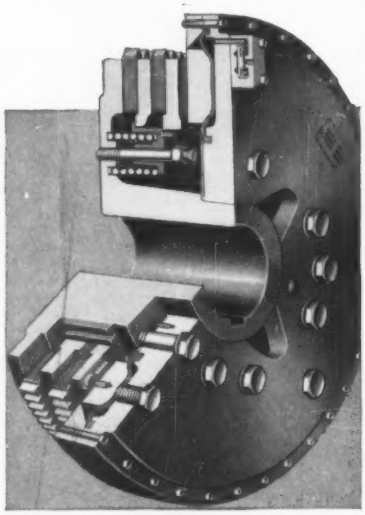
HIGHER TORQUE CAPACITY (with slippage capacities up to 120,000 lbs. ft.).

LESS WEIGHT, NARROWER WIDTH —permitting more compact installations with lower initial costs, and use of air-actuated clutches where drum or band-style clutches previously have been used.

FASTER, SMOOTHER OPERATION with positive air-sealing under all condi tions; featuring fully-supported, no-stretch construction . . . extra-long stroke, and controlled flexing is provided by the exclusive Twin Disc diaphragm.

POSITIVE, QUICK RELEASE . . . no seal-drag . . . built in pressure release valves.

INVESTIGATE Twin Disc Model PO Air-Actuated Clutches for designing into new equipment, or for modernizing older models . . . *write today for new Bulletin 304!*



TWIN DISC CLUTCHES AND HYDRAULIC DRIVES

TWIN DISC

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin
Hydraulic Division, Rockford, Illinois

Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

GRINDING MACHINES, Centerless

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Landis Tool Co., Waynesboro, Pa.
Van Norman Co., Springfield, Mass.

GRINDING MACHINES, Chucking

Baird Machines Co., 1700 Stratford Ave., Stratford, Conn.
Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Bullard Co., Brewster St., Bridgeport, Conn.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Crankshaft

Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Cylindrical

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Landis Tool Co., Inc., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Rivett Lathe & Grinder Inc., Brighton, Boston 35, Mass.
Van Norman Co., 2640 Main St., Springfield 7, Mass.

GRINDING MACHINES, Die Chaser

Eastern Mch. Screw Corp., New Haven, Conn.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Disc

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

GRINDING MACHINES, Drill

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gollmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, Face

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Mattison Machine Works, Rockford, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

GRINDING MACHINES, Flexible Shaft

See Flexible Shaft Equipment
(*Continued on page* 332)

- *Eliminate mechanical connection*
- *Utilize smaller, lower-cost motors*
- *Cushion out shock-loads*
- *Provide quick acceleration*
- *Balance compounded drives*
- *Transmit full input torque continuously*

with

FLUID DRIVES

If your powered equipment starts under load or has frequent running load variations, you can eliminate most maintenance problems with Twin Disc Fluid Couplings. For complete details on selecting and applying Fluid Couplings on motors or engines, ¾ to 850 hp, *write Twin Disc Clutch Company, Dept. DS, Racine, Wisc., today for new Bulletin 144-D.*

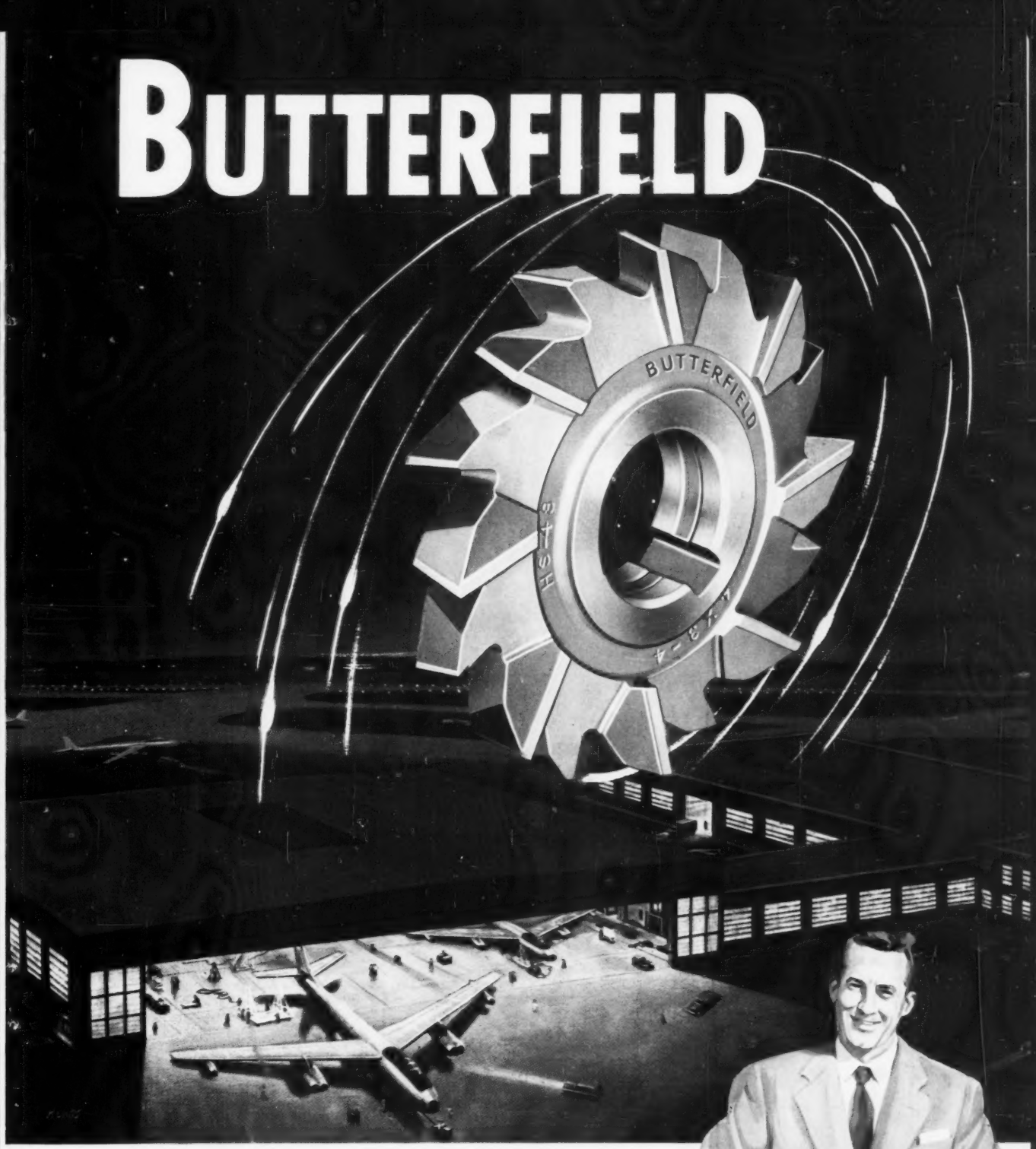
TWIN DISC CLUTCHES AND HYDRAULIC DRIVES

TWIN DISC

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin
Hydraulic Division, Rockford, Illinois

For more information on products advertised, use Inquiry Card, page 241

BUTTERFIELD



A COMPLETE LINE OF QUALITY cutting tools is now available from your Butterfield distributor. Milling Cutters are made to the same exacting standards as Butterfield Taps, Dies, Drills, Reamers, Counterbores and End Mills.

FOR FAST, ECONOMICAL SERVICE
CALL YOUR **BUTTERFIELD** DISTRIBUTOR

UNION TWIST DRILL COMPANY
BUTTERFIELD DIVISION
DERBY LINE, VERMONT, U. S. A.

GRINDING MACHINES, Gap

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Gear Tooth

See Gear Grinding Machines

GRINDING MACHINES For Sharpening Cutters, Reamers, Hobbs, Etc.

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Landis Tool Co., Waynesboro, Pa.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.
Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, For Sharpening Turning and Planing Tools

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
South Bend Lathe Works Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Walker, O. S., Co., Inc., Worcester, Mass.
Waltham Machine Works, Newton St., Waltham, Mass.

GRINDING MACHINES, Internal

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, 32, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Rivett Lathe & Grinder Inc., Brighton, Boston 35, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

GRINDING MACHINES, Jig

Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Moore Special Tool Co. Inc., 724 Union Ave., Bridgeport, Conn.
Pratt & Whitney, West Hartford 1, Conn.

GRINDING MACHINES, Knife and Shear Blade

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.

GRINDING MACHINES, Piston Ring

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Profile

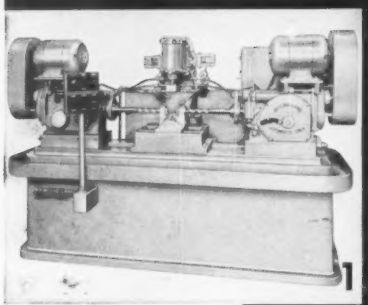
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Cleveland Grinding Machine Co., 1643 Eddy Rd., Cleveland 12, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

GRINDING MACHINES, Ring Wheel Ball Race, Etc.

Landis Tool Co., Waynesboro, Pa.
Van Norman Co., Springfield, Mass.

(*Continued on page* 336)

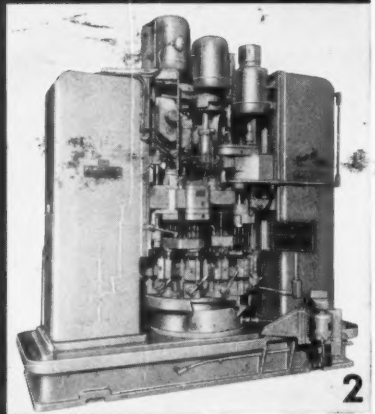
MILLHOLLAND

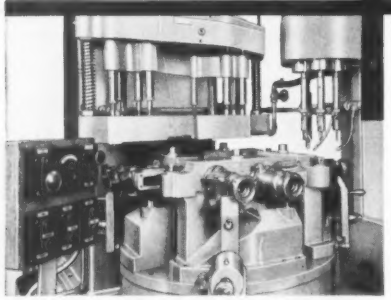


SPECIAL MACHINES

— for your special jobs

Millholland design gives you standard machine flexibility and economy . . . special purpose efficiency . . . and toolroom accuracy. The unique plate type cam, with pneumatic counterbalance used in Millholland Automatic Units, keeps units removing metal 80% of total cycle time. Millholland designs and builds a wide range of machines and fixtures to solve your special production and tooling problems. Let us show you how we can help you combine, speed up and simplify any combination of rotary tool operations.





1. Many different parts are machined on this Double End Machine by changing fixtures, tools, V-belts and cams.

2. Millholland-designed fixtures enable this 12-station, 34-spindle vertical indexing machine to produce 93 pieces per hour.

3. Design features permit this 4-station vertical indexing machine to perform identical operations on two different steering gear housings without tooling changes.

Write for More Information on These Machines in Bulletin 116-M

W. K. MILLHOLLAND MACHINERY Co., Inc.

6402 Westfield Blvd., Indianapolis, Ind.

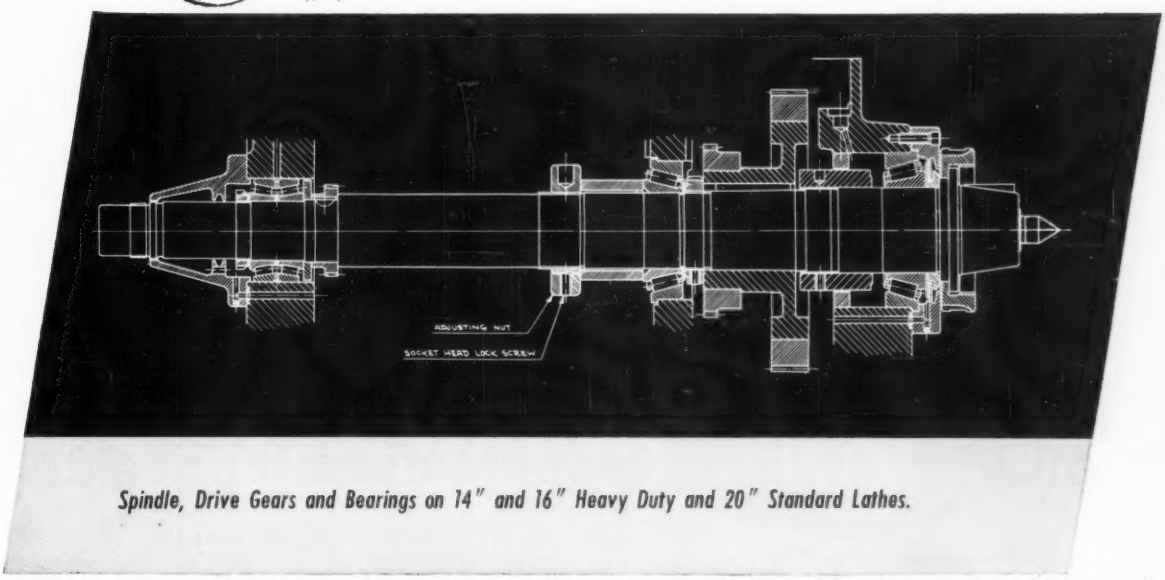
For more information on products advertised, use Inquiry Card, page 241

FOR A BETTER DRIVE

...Lodge & Shipley puts it

"ON THE NOSE"

... Locating drive gears and main bearings near spindle nose, drive gears rigidly keyed to spindle for maximum strength — power — accuracy.

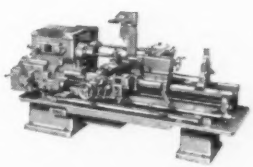


Spindle, Drive Gears and Bearings on 14" and 16" Heavy Duty and 20" Standard Lathes.

Location of driving force and bearings close to the load is a proven advantage in power transmission. Lodge & Shipley drive gears and main bearings are literally "on the nose," grouped at the forward end of the spindle just inside the headstock.

Giving extra ruggedness and power, this detail is an example of the design skill that goes into every part of the Lodge & Shipley Lathe. The result, proved by thousands of users, is a lathe that gives more in production and accuracy—costs less in operation.

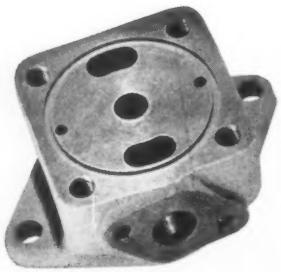
For your next lathe, consider a Lodge & Shipley. A representative will welcome the chance to compare a Lodge & Shipley . . . point by point . . . with any other lathe. Request Bulletin No. 200 which describes and explains the many features. The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.



Lodge & Shipley

....your **LODGE-ical** *choice!*

For more information on products advertised, use Inquiry Card, page 241



milling, drilling, tapping machine yields

Can you afford to ignore an investment that returns 100% in less than a year? It doesn't seem likely, yet many plant operators hold down milling, drilling, and tapping operations to the capacity of standard machines.

In contrast, the owner of this Avey production machine made high returns on this cast iron pump body (it may be similar to yours): 1 operator instead of 6; floor space cut from 600 to 180 sq. ft.; time per part from 5 minutes to 42 seconds. Put these figures in profit-and-loss terms and you see why the Avey machine pays off so fast.

The machine has 10 Avey No. 2 Cam Feed units, a standard ribbed steel base, and standard automatic index table. Fixtures: rigid cam type. All units and the table are electrically interlocked; J.I.C. control panel. Production: 85 parts/hr. at 100% efficiency. ▶ *This machine has now been re-engineered for a different part*—so economically that even higher gains are expected this year.

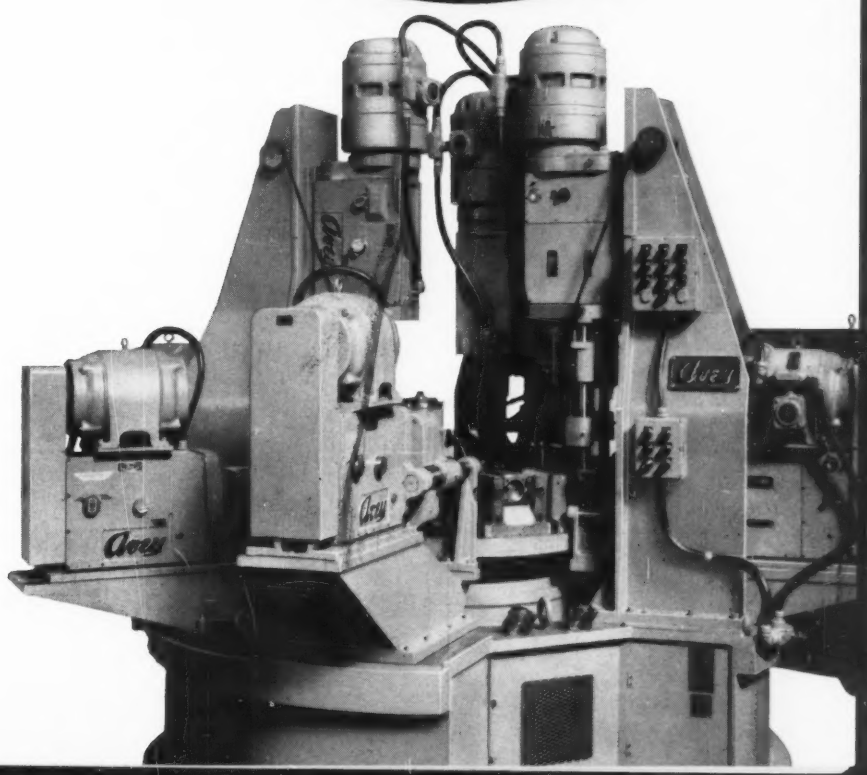
Whatever your cash situation, new tax laws and Avey's pay-as-you-produce plan enable you to make this fast-earning investment now. Send a print of your part, state desired production rate, and ask Avey for a *profit prediction.*◀

THE AVEY DRILLING MACHINE CO., CINCINNATI 1, OHIO

drilling, tapping, production machines

93.4% the first 9 months

Avey



GRINDING MACHINES, Radial

Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

GRINDING MACHINES, Radius, Link

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Roll

Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Farrel-Birmingham Co., 25 Main St., Ansonia, Conn.
Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Spline Shaft

Van Norman Co., Springfield, Mass.

GRINDING MACHINES, Surface

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass. (Rotary)
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Blanchard Machine Co., 64 State St., Cambridge, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Gallmeyer & Livingston Co., 336 Straight Ave., S. W., Grand Rapids 4, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Machine Works, Rockford, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reid Bros. Co., Inc., Beverly, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.
Walker, O. S., Co., Inc., Worcester, Mass.

GRINDING MACHINES, Tap

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.

GRINDING MACHINES, Thread

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Landis Machine Co. (Centerless), Waynesboro, Pa.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

GRINDING MACHINES, Universal

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

GRINDING MACHINES, Worm

Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Pratt & Whitney, West Hartford 1, Conn.

GRINDING WHEELS

Blanchard Machine Co., 64 State St., Cambridge, Mass.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Cincinnati Milling Products Div., Cincinnati Milling Machine Co., Cincinnati, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Gardner Machine Co. (Surface Grinder), 414 E. Gardner St., Beloit, Wis.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.
Smit, J. K. & Sons, Inc., Murray Hill, N. J.

GROOVE PINS

Gillen, John, Co., Inc., 2540 S. 50th Ave., Cicero 50, Ill.

GROOVING TOOLS, Internal

Waldes Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

HAMMERS, Drop

Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.

HAMMERS, Forging Air

Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Lobdell United Co., 200 "G" St., Wilmington 99, Del.

(*Continued on page 338*)

14", 18", 22"
Standard Duty

Superb Swedish craftsmanship, plus fine design and construction backed by 50 years' experience, makes the VMA Shapers outstanding production and toolroom machines.

The standard and heavy duty models cover a range from 14" to 26" stroke length and are available optionally with swiveling or universal table, automatic tool post feed and automatic tool lifter. Table power rapid traverse and foolproof automatic pressure lubrication are standard on heavy duty models. Drive through anti-friction bearing transmission, hardened chrome nickel steel gears and double helical tooth crank gear are some of the quality features which contribute to VMA's stamina, dependability and smooth operation.

Prompt delivery — Attractive Price — Write for Folder!

austin industrial corp.

76-E MAMARONECK AVE., WHITE PLAINS, N. Y.

Dealers in principal cities

Look for the Austin Seal — your full guarantee of satisfaction!

For more information on products advertised, use Inquiry Card, page 241

Put the Bite on Simonds!

...to cut your costs with the right type saw!

✱ INSERTED TOOTH SAW

For heavy production cutting of steel, brass, copper and aluminum. Alternating square and beveled teeth "tri-vide" chips for easy cutting and clearance. Maximum saw clearance gives cooler, freer cutting . . . permits extremely high rate of feed. High Speed Steel Teeth can be easily replaced singly or in complete sets, in your own plant.

✱ SEGMENTAL SAW

For especially smooth cuts on production work. Extra-service High Speed Steel toothed segments are securely held in a tough alloy plate by a tongue and groove design, have quick clearance for faster, freer cutting. Teeth are alternately square and beveled for easy cutting and clearance of "tri-vided" chips. Can be sharpened on any automatic grinder.

✱ SOLID TOOTH SAW

For general shop cut-off jobs . . . for use on smaller automatic cut-off machines, and for cutting jobs where narrow kerf is important. Clearance ground and furnished in High Speed, Si-Maloy (Pat.), or Semi-High Speed Steel. Simonds own steel, plus accurate heat treating and grinding give these saws longer life, more dependable performance.

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.

For Fast Service from Complete Stocks

Call your SIMONDS Industrial Supply DISTRIBUTOR

Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon • Canadian Factory in Montreal, Que.
Simonds Divisions: Simonds Steel Mill, Lockport, N. Y. • Simonds Abrasive Co., Phila., Pa. and Arvida, Que., Canada

CIRCULAR Metal Cutting SAWS

HAMMERS, Pneumatic

Chambersburg Engrg. Co., Chambersburg, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.

HAMMERS, Portable Electric

Millers Falls Co., Greenfield, Mass.

HAMMERS, Power

Chambersburg Engrg. Co., Chambersburg, Pa.
Lobdell United Co., 2000 "G" St., Wilmington 99, Del.

HAMMERS, Shaft

Standard Pressed Steel Co., Jenkintown, Pa.

HAMMERS, Soft

Chambersburg Engrg. Co., Chambersburg, Pa.
Chicago Rawhide Mfg. Co., 1309 Elston Ave., Chicago, Ill.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

HARDENING EQUIPMENT

Gleason Works, 1000 University Ave., Rochester, N. Y.
Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.

HARDENING MACHINES, Flame

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Gleason Works, 1000 University Ave., Rochester, N. Y.

HARDNESS TESTING INSTRUMENTS

Olsen, Tinius, Testing Mch. Co., Philadelphia, Pa.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Shore Instrument & Mfg. Co., Van Wyck Ave., and Carll St., Jamaica, N. Y.
Wilson Mechanical Instrument Co., Inc., 230-D Park Ave., New York, N. Y.

HEADING MACHINES

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

HOBBING MACHINES

See Gear Cutting Machines, Spur and Helical Gears (Hobbing), and Gear Cutting Machines, Worm and Worm Wheels.

HOBS

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Union Twist Drill Co., Athol, Mass.

HOIST HOOKS

Bethlehem Steel Co., Bethlehem, Pa.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

HOISTING AND CONVEYING EQUIPMENT

Cleveland Crane & Engrg. Co., Wickliffe, Ohio.

HOISTS, Air

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hydro-Line Mfg. Co., 5764 Pike Rd., Rockford, Ill.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.

HOISTS, Chain, Etc.

Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

HOISTS, Electric

Philadelphia Gear Works Inc., Erie Ave. and G St., Philadelphia, Pa.

HONING MACHINES, External

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Fulmer, C. Allen, Co., 1231 First National Bank Bldg., Cincinnati 2, Ohio.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Sunnen Products Co., 7900 Manchester Ave., St. Louis 17, Mo.

HONING MACHINES, Internal (Cylinder)

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Fulmer, C. Allen, Co., 1231 First National Bank Bldg., Cincinnati 2, Ohio.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sunnen Products Co., 7900 Manchester Ave., St. Louis 17, Mo.

(*Continued on page* 340)

for fast precision internal finishing of bores

FULMER

HONING MACHINES
15 sizes, diameters from ¼" to 30" with strokes from 12" to 84"

Ferrous, non-ferrous metals, plastics, glass and other materials are finished straight and round to tolerances as close as .0001 (±). Chips run as long as six inches for fastest, most economical honing.

WRITE FOR BULLETIN ON HONING

HONING FIXTURES
designed for your special purposes

FULMER SUPPLIES YOUR HONING NEEDS "ALL IN ONE PACKAGE"

HONING TOOLS
sizes to 50"

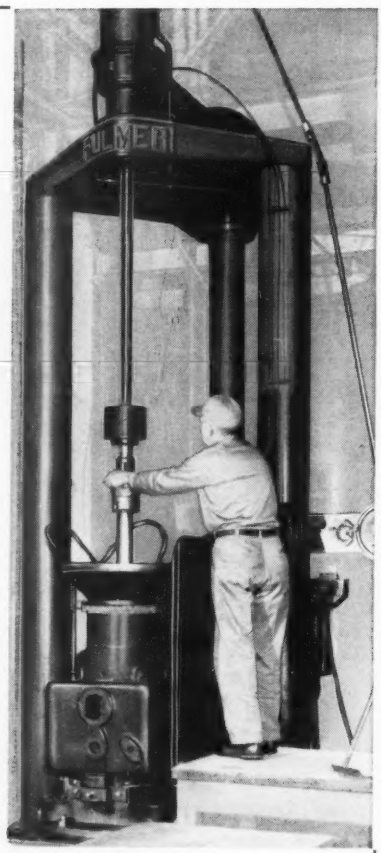


Photo taken in Continental Gin Co., Birmingham, Ala., honing Diesel cylinders.

For Cylinder Blocks, Connecting Rods, Blind End Cylinders, 4-Way Valves and other work.

C. ALLEN FULMER CO.

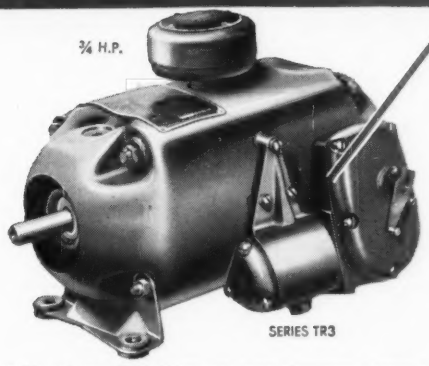
1231 First National Bank Bldg. Cincinnati 2, Ohio

For more information on products advertised, use Inquiry Card, page 241

18% PRODUCTION INCREASE

Maintenance Practically Eliminated

Winding TV power transformer coils at Sparton Radio-Television



VICKERS

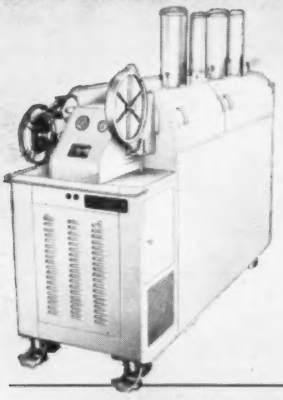
VARIABLE SPEED

Hydraulic Transmission

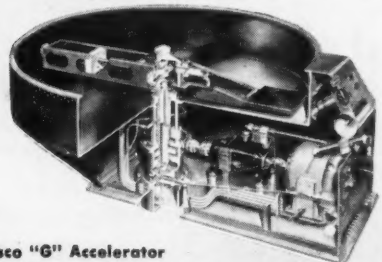
Hourly production was increased 18% when these coil-winding machines at Sparton Radio-Television were equipped with the Series TR3 Vickers Variable Speed Hydraulic Transmission. This improvement resulted from the superior control features inherent in the transmission: (1) extremely quick and smooth variations in speed, (2) maximum torque at low rpm, (3) instantaneous starting and stopping.

While the previous drives required maintenance approximately once a week, the Vickers transmissions have needed attention only three or four times since they were installed four years ago. They have built-in automatic overload protection and they are automatically pressure lubricated by the power-transmitting medium (oil).

Perhaps you have an application where this Vickers Variable Speed Hydraulic Transmission will make similar improvements and economies. Ask the nearest office listed below for Bulletin 47-40a.



Motion Picture Film Processing Machine By Houston Fearless Corp.—Another application where stepless variable speed and constant torque of Vickers Hydraulic Power Transmission provided much more satisfactory operation.



Genisco "G" Accelerator
A rugged, low cost unit used to calibrate accelerometers and other equipment under operational acceleration forces. Speed settings must be accurate and precisely maintained over extended operating periods. Driven by Vickers Variable Speed Hydraulic Transmission.

VICKERS Incorporated
DIVISION OF THE SPERRY CORPORATION
1403 OAKMAN BLVD. • DETROIT 32, MICH.

Application Engineering Offices: • ATLANTA • CHICAGO AREA (Brookfield) • CINCINNATI • CLEVELAND • DETROIT • HOUSTON LOS ANGELES AREA (El Segundo) • MINNEAPOLIS • NEW YORK AREA (Summit, N. J.) • PHILADELPHIA AREA (Media) • PITTSBURGH AREA (Mt. Lebanon) • ROCHESTER • ROCKFORD • SAN FRANCISCO AREA (Berkeley) • SEATTLE • ST. LOUIS • TULSA WASHINGTON • WORCESTER

6486

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

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Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Fulmer, C. Allen, Co., 1231 First National Bank Bldg., Cincinnati 2, Ohio.
Moline Tool Co., 102 20th St., Moline, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.

HONING TOOLS AND FIXTURES

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Fulmer, C. Allen, Co., 1231 First National Bank Bldg., Cincinnati 2, Ohio.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Sunnen Products Co., 7900 Manchester Ave., St. Louis 17, Mo.

HOSE, Leather, Rubber, Metallic, Etc.

American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.

HYDRAULIC MACHINERY
Tools and equipment

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Corp., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Erie Foundry Co., Erie, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Hydro-Line Mfg. Co., 5764 Pike Rd., Rockford, Ill.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Watson-Stillman, Co., Div., H. K. Porter Co., Inc., Roselle, N. J.

HYDRAULIC POWER UNITS OR TOOL HEADS

Barnes Drill Co., 814 Chestnut, Rockford 3, Ill.
Barnes, John S., Corp., Rockford, Ill.
Barnes, W. F. & John Co., 201 S. Waterford St., Rockford, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

INDEXING AND SPACING EQUIPMENT

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

INDICATORS, Dial

Ames, B. C., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

INDICATORS, Speed

Brown & Sharpe Mfg. Co., Providence, R. I.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.

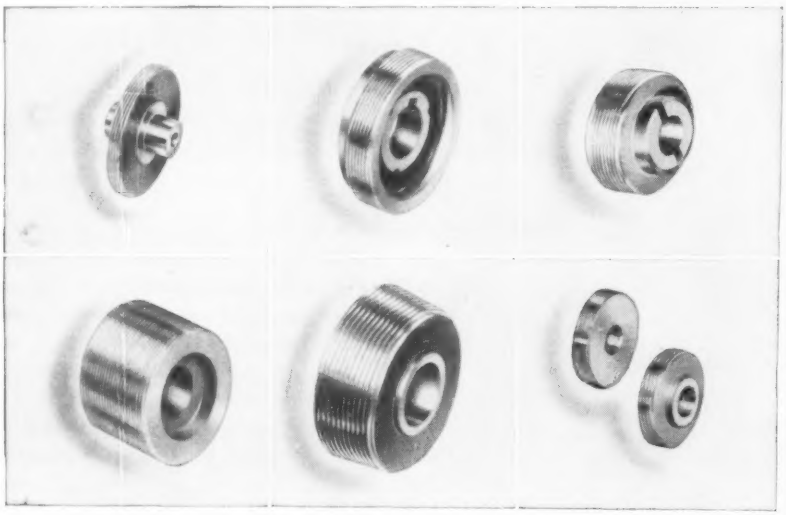
INDICATORS, Test

Ames, B. C., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Micrometrical Mfg. Co. (Surface roughness & waviness), 321 S. Main St. Ann Arbor, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

(*Continued on page* 342)

Thread Rolls

on automatic screw machines and turret lathes



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produce uniform, accurate threads economically

Reed makes special thread rolls of all kinds. Send us samples or detailed specifications of both roll and thread to be produced.

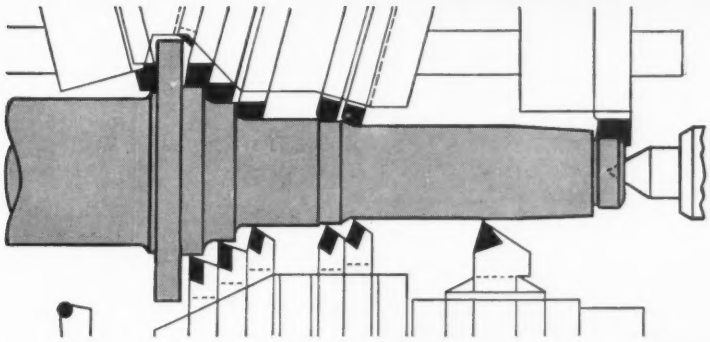
REED ROLLED THREAD DIE CO.

Thread Rolling Machines and Dies, Thread Rolling Attachments, Thread Rolls and Knurls for Automatic Screw Machines and Turret Lathes

WORCESTER, MASSACHUSETTS, U. S. A.

For more information on products advertised, use Inquiry Card, page 241

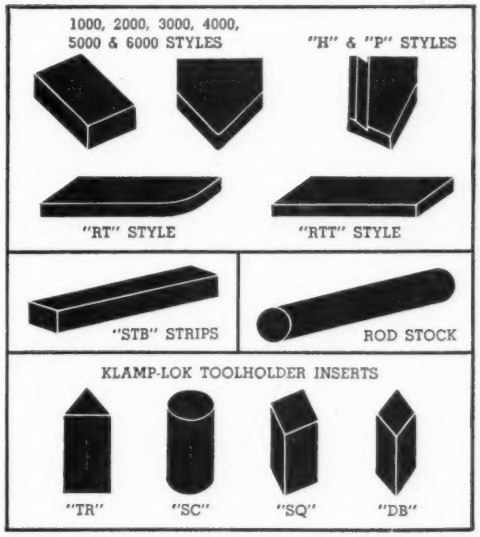
THE TURNING POINT TO HIGHER PROFITS!



PRODUCTION RATE—UP 25%, TOOL COST—DOWN 40% AT LARGE MID-WEST TRACTOR PLANT

PART.....Shaft Steering Clutch, SAE 8654-H Brinell 370.
OPERATION.....Rough Straddle Face Flange, turn all diameters, form undercut and base.
MACHINE.....16 x 60 Sunstrand Automatic Lathe.
TOOLS.....8 Talide-tipped facing, chamfering, radius and form tools Grade S-88. 7 Klamp-Lok Toolholders with round, triangular and parallelogram Talide inserts Grade S-88.
DEPTH OF CUT..9/32" to 7/16"
FEED.....022
S.F.M.....156
RESULTS.....Production up 25%—Scrap and rejects down.

A FULL LINE OF TALIDE TIPS IS AVAILABLE IN OVER 1000 SIZES, STYLES, SHAPES AND GRADES—TO MEET EVERY MACHINING REQUIREMENT



NEW IMPROVED CUTTING GRADES

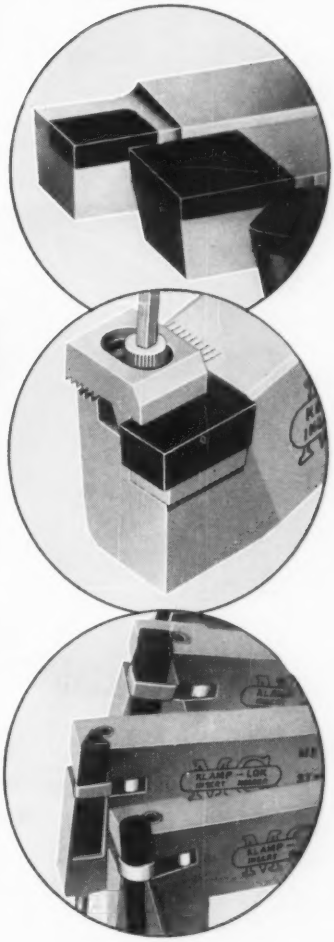
An extensive 2-year research and development program has resulted in a completely new and improved series of Talide Metal grades for all-purpose machining. "Double-carbides" containing tantalum carbide and tungsten carbide have been perfected for cutting cast iron and non-ferrous alloys, and "triple-carbides" containing tantalum carbide, titanium carbide and tungsten carbide for machining steels.

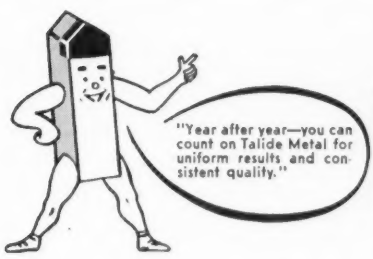
Major improvements have been made in our rigidly controlled vacuum furnace technique. This, along with additional refinements in our process has resulted in the creation of a carbide having a new, unique grain structure possessing harder and tougher properties than previous grades.

Laboratory tests reveal that these new, improved grades have 25% greater strength and rigidity. Extensive field tests have proven that service life per grind is increased up to 50% over previous grades. **Metal Carbides Corporation, Youngstown 7, Ohio.**

Send for new 84-page Catalog No. 55-G.

ALL-PURPOSE TALIDE TOOLS





METAL CARBIDES CORPORATION
TALIDE®
YOUNGSTOWN 7, OHIO
HOT PRESSED AND SINTERED CARBIDES · VACUUM METALS
HEAVY METAL · CERMETS · HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

INDUCTION HEATING EQUIPMENT
General Electric Co., Schenectady, N. Y.
Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.

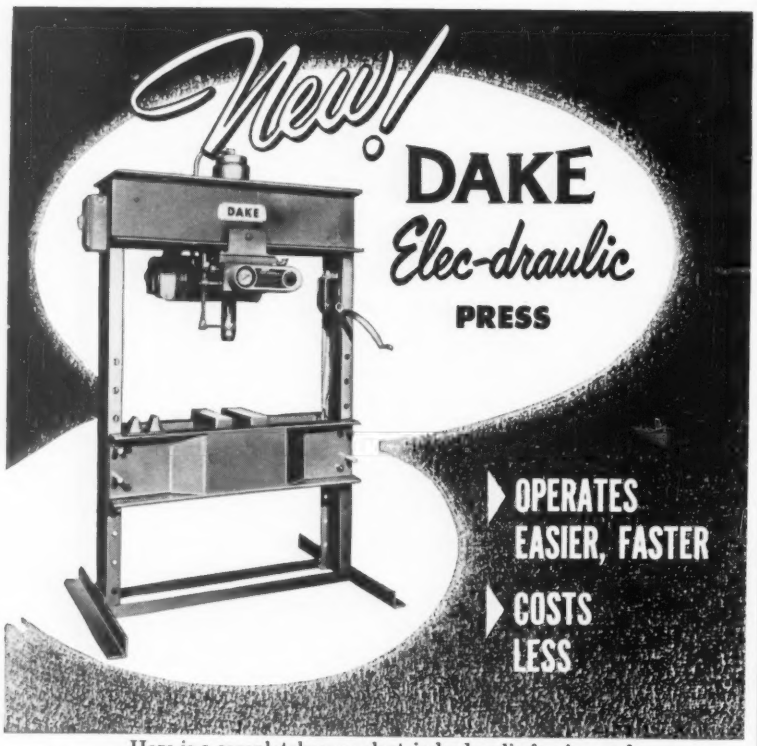
INTENSIFIERS, Hydraulic
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Hydro-Line Mfg. Co., 5764 Pike Rd., Rockford, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

JACKS, Machine Leveling
Enterprise Mch. Parts Corp., Detroit, Mich.

JACKS, Planer
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

JIG BORER
See Boring Machines, Jig

JIGS AND FIXTURES
Columbus Die, Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Machine Co., 2442 Douglas St., Rockford, Ill.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.



Here is a completely new electric-hydraulic forcing and straightening press, with construction and operating advantages never before offered in a low-cost shop press.

These are a few of the features:

- **Rapid Ram Approach** — Automatically changes to power stroke when it contacts the work.
- **Movable Workhead** — Self-contained—easy to center over the work. Workhead can be purchased separately.
- **Variable Ram Speed** — From zero to maximum under fingertip control.
- **Modern Design** — All operating controls at convenient working height.

These and dozens of other features are fully described and illustrated in new Bulletin No. 347, which we will send promptly on request. Send the coupon today.

DAKE PRESSES

DAKE ENGINE COMPANY
604 Seventh Street, Grand Haven, Mich.
Please send Bulletin No. 347
Name_____
Company_____
Address_____
City_____ Zone____ State____

Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
National Broach & Machine Co., 5600 St. Jean St., Detroit 13, Mich.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

JOINTS
See Fittings, Hydraulic, Pneumatic, Etc.

KEYS, Woodruff, Machine, Special
Standard Automotive Parts Co., 660-668 Nims St., Muskegon, Mich.

KEYSEATERS
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Co., Rochester, N. Y.
Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Mitts & Merrill, 68 Holden St., Saginaw, Mich.

KNURL HOLDERS
Brown & Sharpe Mfg. Co., Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.

KNURLING TOOLS
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

LAPPING MACHINES
Barnes Drill Co. (Straight Line or Rotating), 814 Chestnut St., Rockford, Ill.
Cincinnati Grinders, Inc. (Centerless), Cincinnati, Ohio.
Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill. (Lapmaster Div.)
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

LAPPING PLATES, Hand
Crane Packing Co., 1800 Cuyler Ave., Chicago.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.

LATHE AND GRINDING DOGS
Armstrong Bros. Tool Co. 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

LATHE ATTACHMENTS
American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Axelson Mfg. Co., P.O. Box 15335, Vernon Sta., Los Angeles 58, Cal.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Jones & Lamson Mch., 160 Clinton St., Springfield, Vt.
Knapp, B. L., Ind., 107 N. Franklin Ave., Syracuse 4, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.

(*Continued on page 346*)

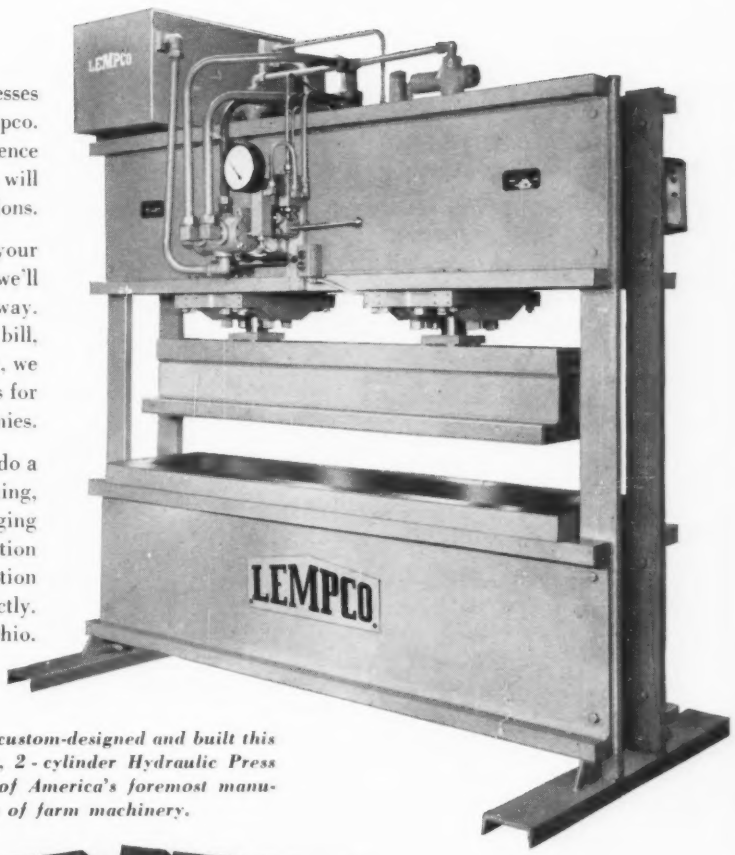
For more information on products advertised, use Inquiry Card, page 241

MEASURE YOU UP FOR A HYDRAULIC PRESS?

"Custom tailoring" Hydraulic Presses to do a particular job is our specialty at Lempco. And our 35 years of press-building experience is your guarantee that the press will measure up to expectations.

Lempco will tailor-make a Press to your specifications. Just tell us your needs and we'll get our Engineering Department on it right away. Of course, if a standard Press will fill the bill, we have a full line of those too. Incidentally, we have designed and built Hydraulic Presses for many of America's largest companies.

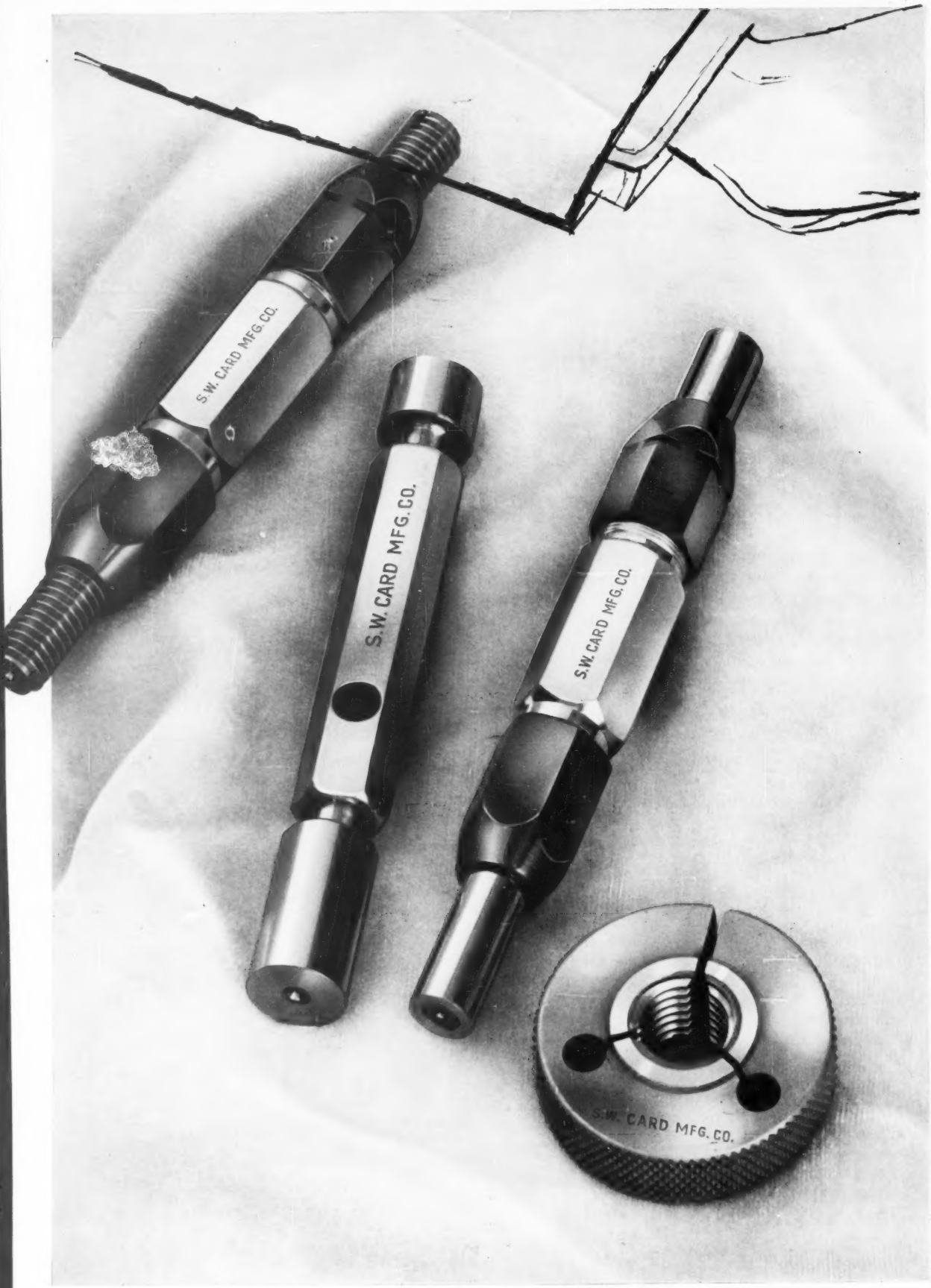
So if you need a special Press to do a special job — straightening, bending, blanking, forming, deep-drawing, hot or cold forging or any other Hydraulic Press operation — drop us a line. We promise you *fast* action and a Press that will fill your needs exactly. Lempco Products Inc., Bedford, Ohio.



Lempco custom-designed and built this 300-ton, 2-cylinder Hydraulic Press for one of America's foremost manufacturers of farm machinery.

BEDFORD **LEMPCO** OHIO, U. S. A.

For 35 Years – a Leading Builder of Machine Tools


S.W. CARD MFG. CO.
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GAGES *by* CARD

Card proudly introduces a select line of precision gages, with the same quality of manufacture associated with Card taps over the past 80 years. Inspect these gages at your distributor's now.

Contact your local Card Distributor for prompt deliveries and helpful service.

The CARD Quality

S. W. CARD MANUFACTURING CO.
MANSFIELD, MASS.

DIVISION OF UNION TWIST DRILL CO.
TAPS · DIES · SCREW PLATES · GAGES

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Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sidney Machine Tool Co., Sidney, Ohio.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHES, Automatic

Axelson Mfg. Co., P.O. Box 15335, Vernon Sta., Los Angeles 58, Cal.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Goss & DeLeeuw Mch. Co., Kensington, Conn.
Hydra-Feed Machine Tool Corp., 730 W. Eight Mile Rd., Ferndale 20, Mich.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Axle

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Bench

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

LATHES, Boring

Axelson Mfg. Co., P.O. Box 15335, Vernon Sta., Los Angeles 58, Cal.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Sidney Machine Tool Co., Sidney, Ohio.

LATHES, Crankshaft

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Double-End

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Duplicating

Axelson Mfg. Co., P.O. Box 15335, Vernon Sta., Los Angeles 58, Cal.
H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Hydro-Feed Machine Tool Corp., 730 W. Eight Mile Rd., Ferndale 20, Mich.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Sidney Machine Tool Co., Sidney, Ohio.

LATHES, Engine and Toolroom

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Axelson Mfg. Co., P.O. Box 15335, Vernon Sta., Sta., Los Angeles 58, Calif.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.

(*Continued on page 350*)

Sheldon's larger, wider "Zero Inspection", Tapered Roller Spindle Bearings save you money by making these lathes better in 6 ways.

Write for G-55 catalog showing new 10" 11" and 13" swing, bench, cabinet and pedestal mounted Sheldon Precision lathes.

1st They *meet* Sheldon's high standard for accuracy—each bearing has a run out limited to .00015"

2nd They absorb thrust and radial loads beyond requirements—basic rating on front bearing at 500 R.P.M.
for radial loads.....3540 lbs.
thrust loads.....2335 lbs.

3rd They *end* costly bearing maintenance—require only a fractional turn of bearing take-up after long periods of service.

4th They *hold* the spindle in rigid alignment while permitting it to turn freely at high or low speeds—the line contact between rolls and races, and the opposing taper design, preclude lateral movement or end play.

5th They *minimize* friction—smooth mirror finished rollers and races running in light oil, deliver more horsepower at the Spindle Nose and lower power costs.

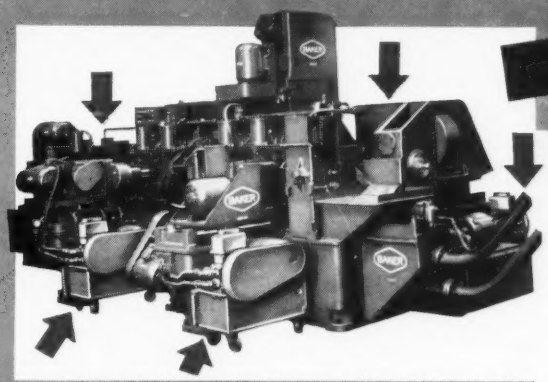
6th They *increase* work capacity. Larger than similar type bearings on other lathes in this price range, these bearings make it possible to turn out *more work* and *better* work at lower costs.

SHELDON MACHINE CO., INC.
4246 NORTH KNOX AVE. • CHICAGO 41, ILLINOIS

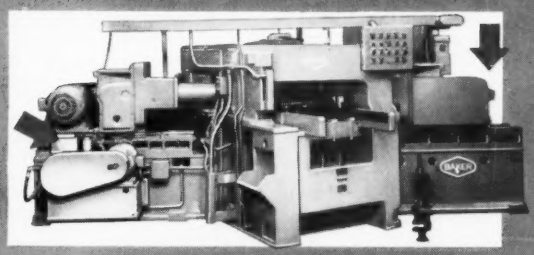
For more information on products advertised, use Inquiry Card, page 241

OILGEAR "JK" FLUID POWER FEED PUMPS

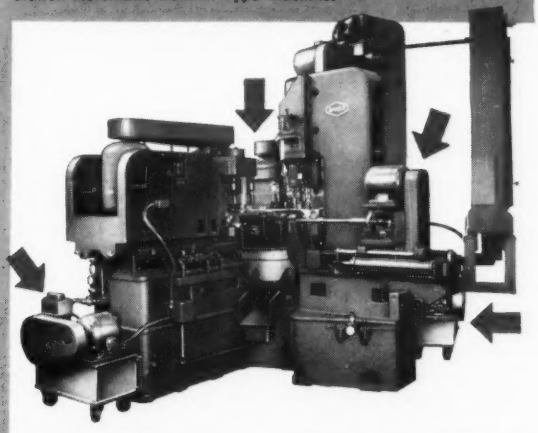
AS APPLIED TO BAKER BROTHERS MACHINES



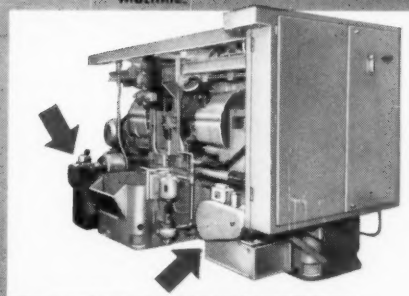
Five Oilgear "JK" Feed Pumps on Baker's Multiple Station Automatic Transfer Type Machine.



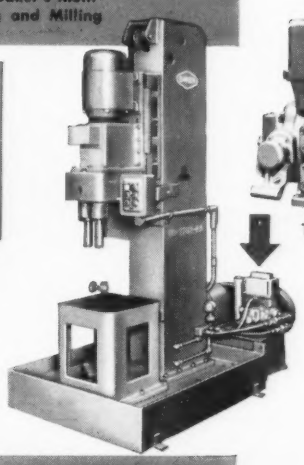
Two Oilgear "JK" Feed Pumps on Baker's Four-Station Automatic Transfer Type Machine.



Four Oilgear "JK" Feed Pumps on Baker's Multiple Head Drilling, Boring, Reaming and Milling Machine.



Two Oilgear "JK" Feed Pumps on Baker's Double End Drilling, Boring and Reaming Machine.



Oilgear "JK" Feed Pump on Baker's Double Spindle Vertical Drilling, Boring and Reaming Machine.

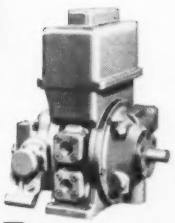
HOW CAN YOU USE THESE SIMPLE, VERSATILE, EASILY APPLIED, PROFITABLE UNITS?

Baker Brothers, Inc., pioneers in machine building, users of Oilgear Feed Pumps since 1925, employ Oilgear "JK" Fluid Power Variable Delivery Feed Pumps on a host of machines including the headline-making 100-foot-long transfer machine and their own commercially available portable hydraulic power unit which you can see in photos Nos. 1 and 3 on this page.

The Oilgear "JK" Feed Pump offers many advantages, not the least of which are easy applicability and accessibility. There's no need in many cases for machine redesign and engineering. And this unit does so much to speed cycle time—traverse speed for example can be 265 times feed rate—that production rises dramatically and costs subside. Both coarse and fine feed rates can be varied infinitely so you at once discover the best rates for your work—and the automatic built-in compensator holds the selected fine feed *unvaryingly*. All functions are controlled automatically, semi-automatically or manually.

Evidence of Oilgear "JK" dependability is growing. In one large automotive plant, now 75% changed over to Oilgear, hydraulic maintenance staff was cut from 6 men to one man per shift. In another great automotive plant, the records show Oilgear is found to give the finest service of all.

There's much more to tell especially about two new units added to the "JK" line. Why don't you send for free literature that gives all the facts and figures. So you won't forget, send for it now.



Type "JK" Pump Built in four sizes.

THE OILGEAR COMPANY
1569 W. PIERCE STREET
MILWAUKEE 4, WIS.

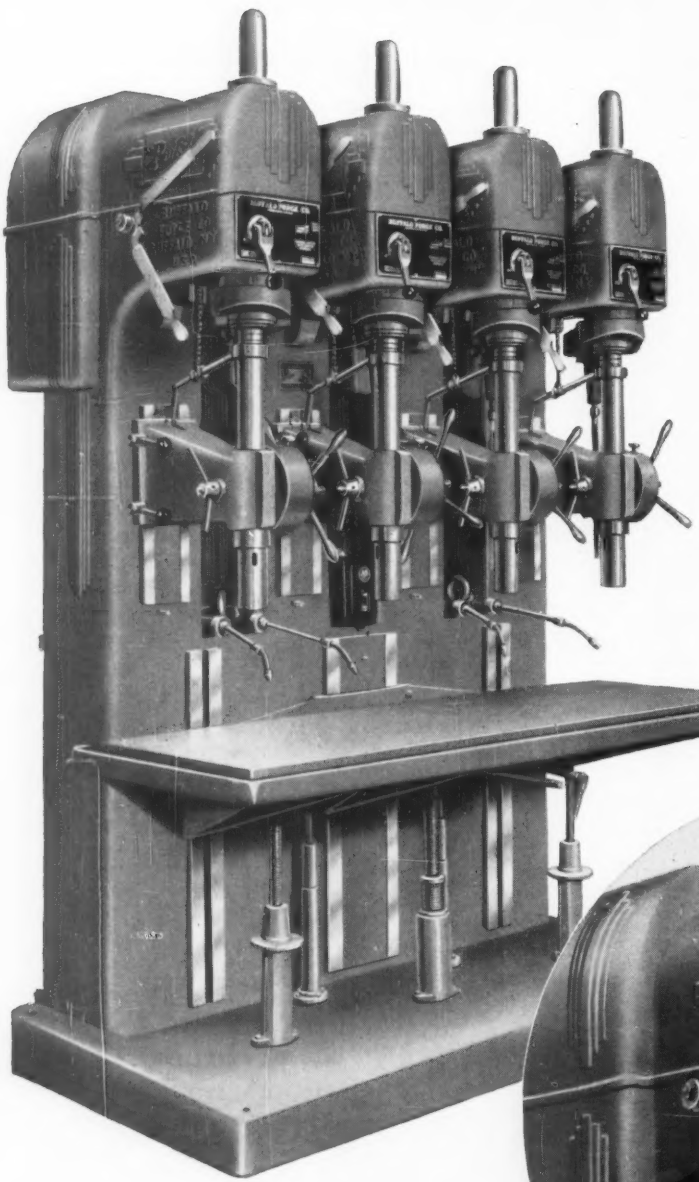
OILGEAR
Fluid Power

PIONEERS . . . NOW THREE PLANTS FOR FLUID POWER

PUMPS, MOTORS, TRANSMISSIONS, CYLINDERS AND VALVES

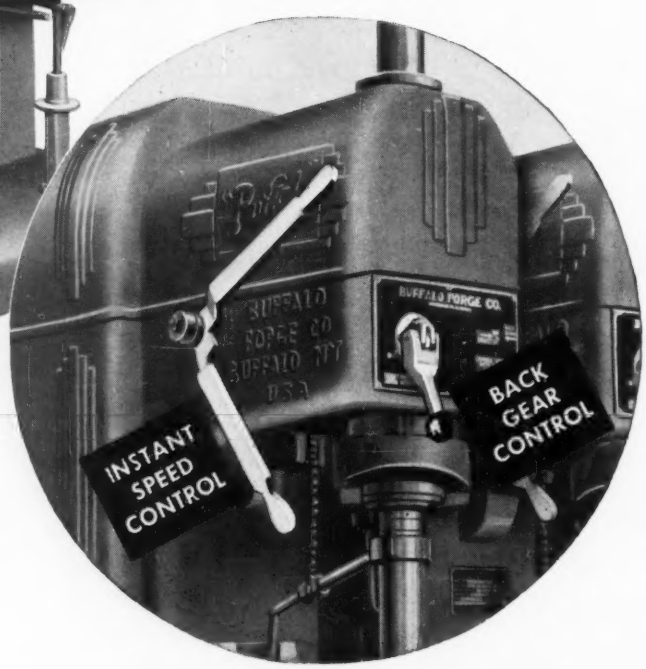
"Buffalo"

FOR MORE YEARS
The Drills Built



On these two pages, there's a "Buffalo" Drilling Machine that can cut your costs on any job. We know this, because these husky, precision-built machines have been doing it for industry for many years. "Buffalo" Drills are easy and convenient to operate, durable and trouble-free. And in every one, you get an extra bonus—*the "Q" Factor—the built-in Quality which provides trouble-free satisfaction and long life*—that has been in "Buffalo" products for 78 years.

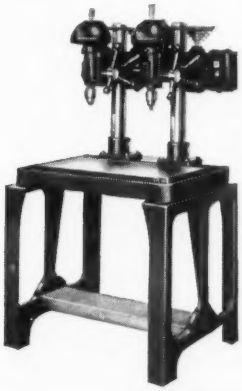
For drills you'll be glad you bought, millions of holes later, write for Bulletins on any of the drills shown. They're all available in one to six spindle models with a wide choice of modifications to suit your setup.



The "RPMster," Drill of 1001 Speeds, for plants that insist on the finest! Here is instant spindle speed control (with motor running), back gearing and all-geared power feed. Shown is our 4-spindle model with coolant system. Write for Bulletin 3257B.

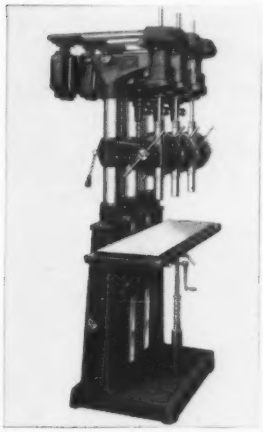
OF LOWER COST DRILLING

Specifically For Industrial Service!

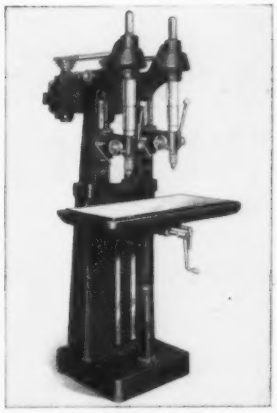


"Buffalo" No. 15 2-spindle Drill.

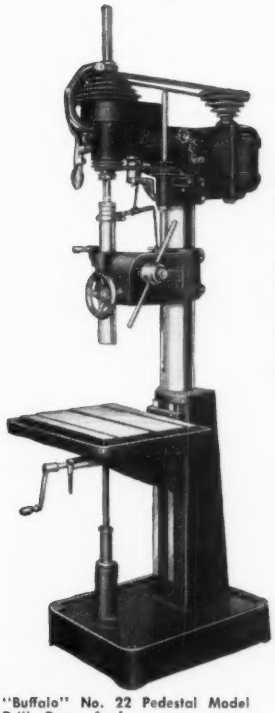
HEAVY-DUTY PRODUCTION up to ½" capacity! Many models of this sturdy versatile No. 15 Drilling Machine to handle a wide variety of work at profitable speed. Write for Bulletin 2963-F.



Sensitive or power feed—choice of 8", 12" and 16" overhangs—plus many excellent features—make these ¾" capacity No. 16 Drills one of the best buys in the industry. Shown is the 3-spindle Pedestal Model. Write for Bulletin 2730-G.

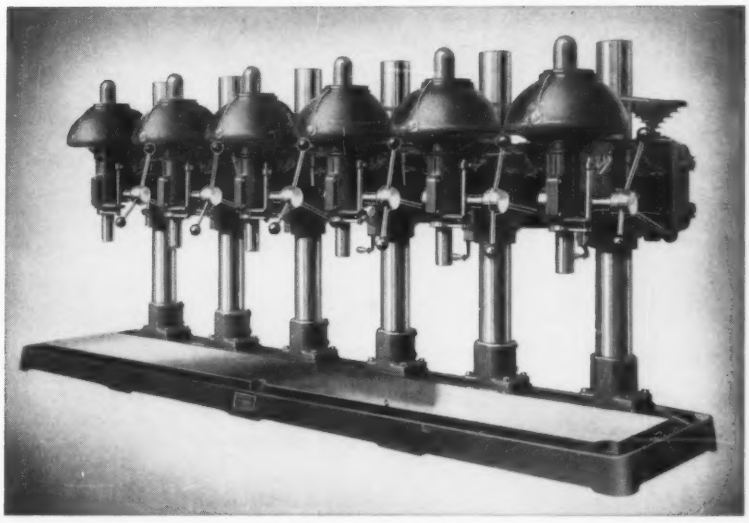


FOR PRECISION DRILLING in the tool room and manufacturing of precision parts, the ⅜" capacity No. 14 Drill is unexcelled. Bench or pedestal types, single or multiple spindle. Write for Bulletin 2726-D.



"Buffalo" No. 22 Pedestal Model Drill. Power feed.

Another "best buy," this machine is 94" to 97" high, yet has controls that are as easily reached as in small machines! Extremely sturdy for the heaviest work. Sensitive or power feed, round column or pedestal models. Bulletin 2989-F.



1" CAPACITY HIGH GRADE GENERAL PURPOSE DRILLS. "Buffalo" No. 18 Drills are available in 19 models, in bench and floor types and in multiple units up to 6 spindles. For general shop and production work. Write for Bulletin 3123-E.

BUFFALO FORGE COMPANY

440 BROADWAY BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING • PUNCHING • SHEARING • BENDING

"Buffalo"

Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Sidney Machine Tool Co., Sidney, Ohio.
Simmons Machine Tool Corp., 1600 N. Broadway, Albany, N. Y.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.

LATHES, Gap

Axelson Mfg. Co., P.O. Box 15335, Vernon Sta., Sta., Los Angeles 58, Calif.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sidney Machine Tool Co., Sidney, Ohio.
Springfield Mch. Tool Co., Springfield, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHES, Gun

Axelson Mfg. Co., P.O. Box 15335, Vernon Sta., Sta. Los Angeles 58, Cal.
Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Springfield Machine Tool Co., Springfield, Ohio.

LATHES, Hollow Spindle

Axelson Mfg. Co., P.O. Box 15335, Vernon Sta., Sta., Los Angeles 58, Calif.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

LATHES, Manufacturing Type

Hydra-Feed Machine Tool Corp., 730 W. Eight Mile Rd., Ferndale 20, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

LATHES, Spinning

Bliss, E. W., Co., 1375 Raff Rd., S. W. Canton, Ohio.
Ferracute Machine Co., Bridgeton, N. J.

LATHES, Toolroom

See Lathes, Engine and Toolroom

LATHES, Turret

Bardons & Oliver Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Brothers, Inc., (Bench or Cabinet Mounting), 1418 College Ave., Elmira, N. Y.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Potter & Johnson Co. (Automatic), 1027 Newport Ave., Pawtucket, R. I.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHES, Vertical Turret

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

LAYOUT FLUID

Dykem Co., 2303 P. North 11th St., St. Louis 6, Mo.

LEVELS

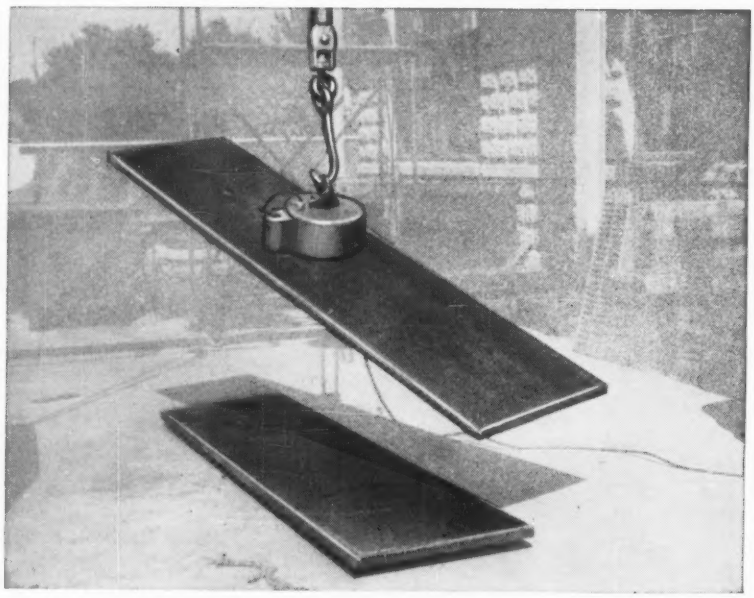
Bullard Co., Brewster St., Bridgeport 2, Conn.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

LOCKNUTS

Link-Belt Co. (For Positioning Bearings), 519 N. Holmes Ave., Indianapolis 6, Ind.

(Continued on page 352)

Walker Does It Again-



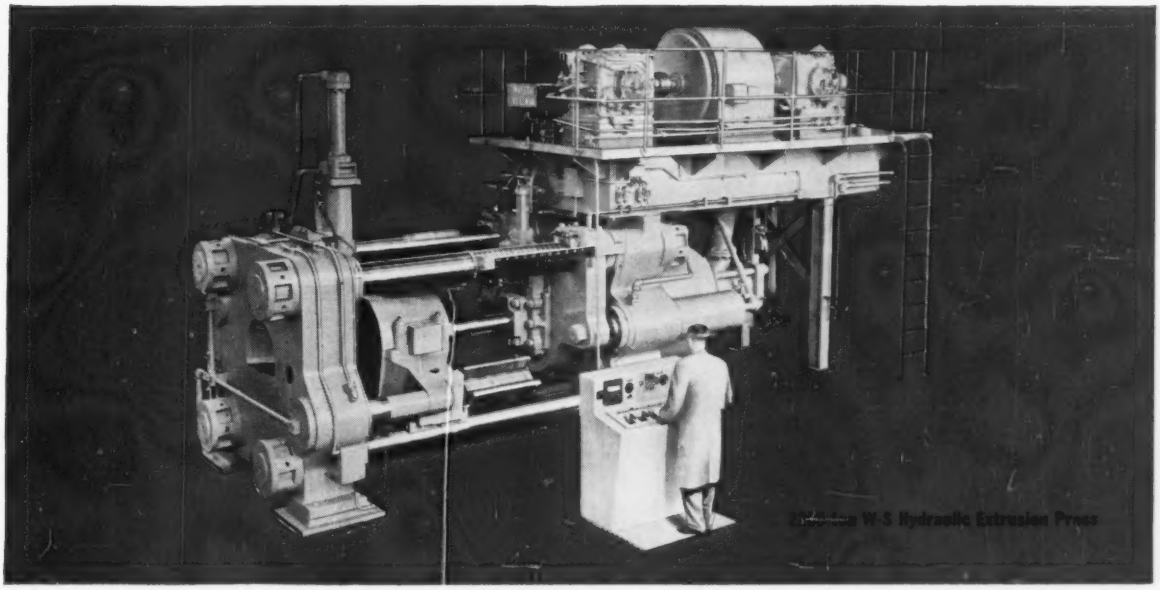
WALKER LITTLE GIANT—the most powerful lifting magnet yet designed will lift 1000 pounds, utilizing less energy than the ordinary 150-watt kitchen lamp . . . can be designed for all voltages from a 6-volt car battery to 220-volt DC power line . . . practical for electric powered trucks and lifts.

Chucks: Rectangular, Swiveling, Rotary, Vacuum, Special Types . . . Demagnetizers . . . Planer Parallels . . . and Magnetic Hoists.

O. S. WALKER CO. Inc.
WORCESTER 6, MASSACHUSETTS
Original Designers and Builders of Magnetic Chucks

For more information on products advertised, use Inquiry Card, page 241

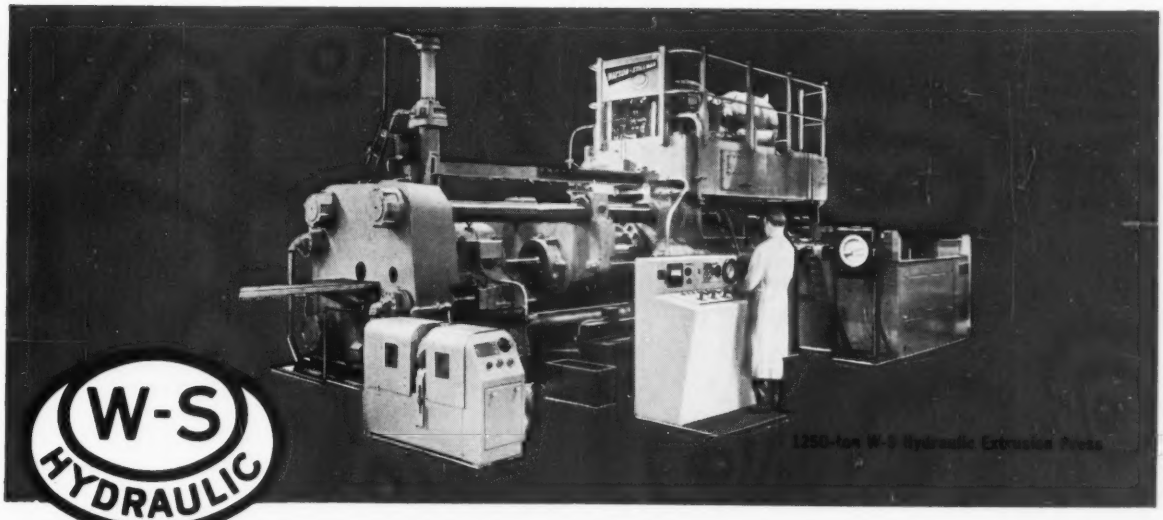
THE WORKHORSES OF THE INDUSTRY



When you buy a hydraulic extrusion press, you want to be sure of a press that stays on the job. You want to be sure, too, of the most advanced design for simplicity of operation and high production rates.

These are features that have made Watson-Stillman Hydraulic Extrusion Presses *the workhorses of the industry.* The "Completeline" of W-S Presses, conservatively rated at capacities from 500 to 5,000 tons, are designed for light metals, other non-ferrous metals, and steel.

Every step in the manufacture of these presses is conducted within the Watson-Stillman plant —design, engineering, pattern-making, machining, assembly, testing and shipment. That is why—for the soundest investment in extrusion presses—it pays to consult Watson-Stillman first.



W-S HYDRAULIC

ESTABLISHED 1848

THE WATSON-STILLMAN COMPANY

DIVISION OF H. K. PORTER COMPANY, INC.

161 Aldene Rd., Roselle, New Jersey

A DIVISION OF HKP H. K. PORTER COMPANY, INC.

LUBRICANTS, Including Extreme Pressure (EP) Machinery Lubricants

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 120 Lockwood St., Newark 5, N. J.
Shear-Speed Chem. Prod. Div., Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.
Sinclair Refining Co., 600 5th Ave., New York, N. Y.
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.

LUBRICATING SYSTEMS

Farval Corp., 3249 E. 80th St., Cleveland, Ohio.
Madison-Kipp Corp., Madison, Wis.
Norgren, C. A., Co., Inc., 3419 S. Elati St., Englewood, Colo.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

MACHINE KEYS

Gillen, John, Co., Inc., 2540 S. 50th Ave., Cicero 50, Ill.

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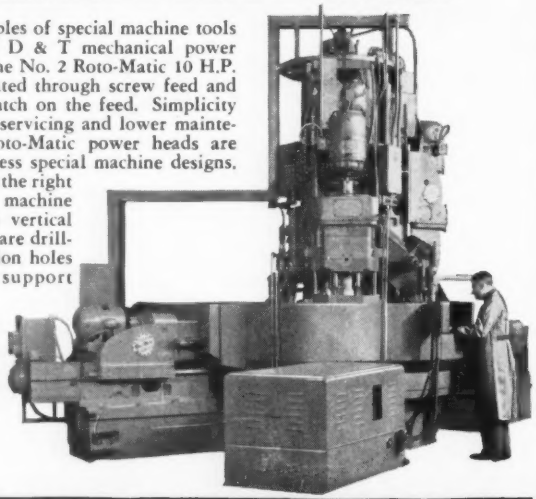
Gillen, John, Co., Inc., 2540 S. 50th Ave., Cicero 50, Ill.

MACHINISTS' SMALL TOOLS

See Calipers, Hammers, Wrenches, Drills, Taps, Etc.

Use D&T Machines With New Mechanical Power Heads

Here are two good examples of special machine tools designed and built with D & T mechanical power heads. Shown above, is the No. 2 Roto-Matic 10 H.P. head. All sizes are operated through screw feed and have overload release clutch on the feed. Simplicity of design makes for less servicing and lower maintenance costs. D & T Roto-Matic power heads are readily adapted to countless special machine designs. For instance: Machine to the right is a 6 station indexing machine with 3 horizontal and 3 vertical power heads. Operations are drilling and reaming suspension holes and king pin holes in support arms for power heads.



Free Data

Is available on the complete line of D & T machines. Ask for Bulletin 1000.

DAVIS and THOMPSON Roto-Matic

Davis & Thompson Company

6411 W. BURNHAM ST., MILWAUKEE 14, WISCONSIN

MANDRELS

See Arbors and Mandrels.

MARKING MACHINES AND DEVICES

Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit, Mich.

MEASURING MACHINES AND INSTRUMENTS, Precision

Cleveland Instrument Co., 735 Carnegie Ave. Cleveland 15, Ohio.
Crane Packing Co., 1800 Cuyler Ave., Chicago.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Max Wyler, 611 W. 43rd St., New York 36, N. Y.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

MEASURING WIRES, THREAD, SPLINE AND GEAR

Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

METAL, Bearings

See Bearings, Bronze, Babbitt, Etc., and Bushings, Brass, Bronze, Etc.,

METAL FINISHINGS

Parker Rust Proof Co., 2194 E. Milwaukee, Detroit 11, Mich.

METERS

See Recording Instruments

MICROMETERS

Ames, B. C., Co. (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co. Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

MICROSCOPES, Toolmakers

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

MILLING ATTACHMENTS

Brown & Sharpe Mfg., Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

(*Continued on page* 354)

For more information on products advertised, use Inquiry Card, page 241

Saves Time... Cuts Costs

Rotary Planer . . . do milling jobs in one-third to one-seventh of time on an Espen-Lucas Rotary Planer.

Big Sawing . . . production cutting of large stock —rapid, easy, straight-to-a-line piece after piece—on Espen-Lucas Cold Sawing Machines.

The **ESPEN-LUCAS** *Machine Works*

Front Street and Girard Ave., Phila. 23, Pa.

BUILDERS OF LARGE COLD SAWING MACHINES • ROTARY PLANERS • COLUMN FACERS • HEAVY TYPES OF SPECIAL MACHINERY

MILLING AND CENTERING MACHINES

Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Jones & Lamson Mch. Co. (Automatic), 160 Clinton St., Springfield, Vt.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Automatic

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Kearney & Trecker Corp., Milwaukee, Wis.
Milholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Bench

Hardinge Bros., Inc., (Bench or Pedestal Type), 1418 College Ave., Elmira, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
U. S. Burke Machine Tool Div., Brotherton Rd., Cincinnati 27, Ohio.

MILLING MACHINES, Circular, Continuous

Consolidated Mch. Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Espen-Lucas Mch. Works, Front St., and Girard Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Duplex

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St., and Girard Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Hand

Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
U. S. Burke Machine Tool Div., Brotherton Rd., Cincinnati 27, Ohio.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Horizontal, Plain and Universal

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Lincoln Type

Brown & Sharpe Mfg. Co., Providence, R. I.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Planer Type

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St., and Girard Ave., Philadelphia, Pa.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave., and Penn. R. R., Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co. 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.

MILLING MACHINES, Profile

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

(*Continued on page 356*)

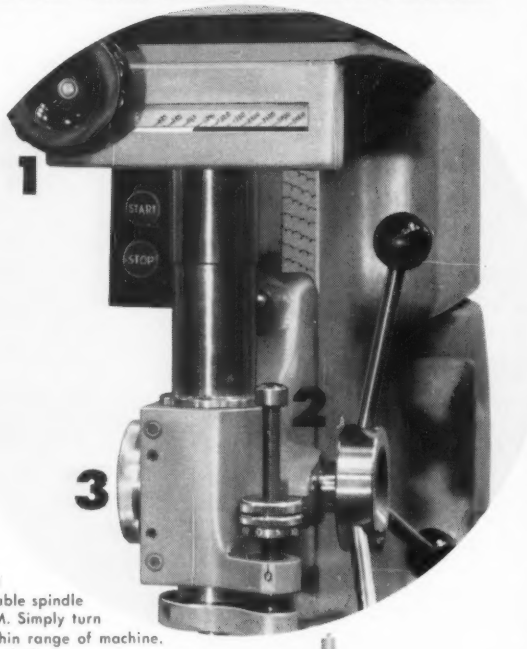
EDLUND PRECISION ENGINEERED EDLUND PRECISION ENGINEERED

new

SENSITIVE DRILLING MACHINE

EDLUND

Model 1F



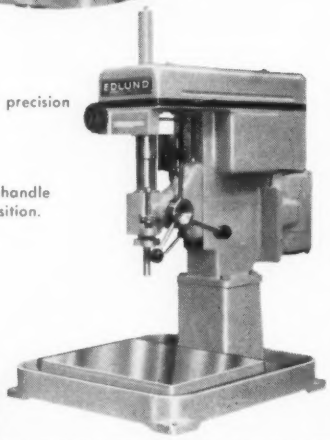
1
Vari-Speed Control and Indicator Infinitely variable spindle speeds up to 10000 RPM. Simply turn knob for any speed within range of machine. Swift, Powerful, Positive Action.

2
Micrometer Graduated Depth Gauge
Permits accurate prepositioned depth control for precision drilling. Clearly graduated to .001".

3
Adjustable Spindle Tension Control
Compensates for weights of various drills. Three-handle feed lever lets operator choose best feeding position.

Specifications
Overhang ..... 7"
Capacity (Cast Iron) ..... 3/4"
#1 Morse Taper or Jacobs Chuck ... O-3/4"
Speed Range—Optional ....
625 to 5000 RPM
1250 to 10000 RPM
Pedestal or Bench Models

Send for Free Illustrated Bulletin #160

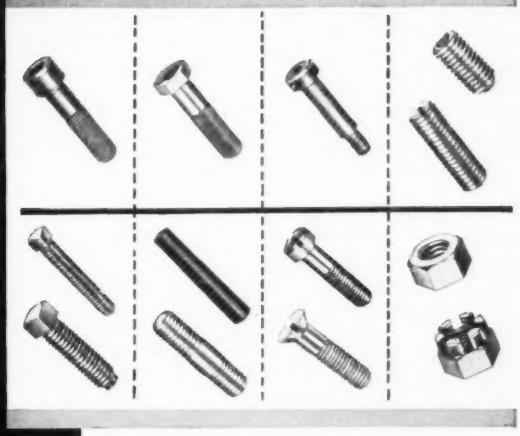


EDLUND MACHINERY CO.
Division Bradley-Edlund Corp. Cortland, N. Y.

EDLUND PRECISION ENGINEERED EDLUND PRECISION ENGINEERED

For more information on products advertised, use Inquiry Card, page 241

Cut Assembly and Production Costs with "CHICAGO" Standard Threaded Products



For whatever purpose, production or maintenance, "Chicago" Threaded Products for 82 years have been precision made to assemble faster with less "on the job" trouble.

Specify standard sizes for faster deliveries, greater savings over "specials" and less downtime. Our more complete stocks mean "at once" shipments when you need them—no production delays—no maintenance "shut downs"—no large inventories necessary.

The "Chicago" line of threaded products is a complete line, available from the stocks of your service-conscious Industrial Supply dealer—in bulk or in packages for original equipment or replacement. Ask him for samples—he will gladly supply them.

This new 36-page catalog tells the whole story of the "Chicago" complete line of threaded products. Ask for your copy today.

All "Chicago" Screw Products come packed in strong, easier-to-see packages. Color coded labels mean faster selection, greater savings of time in your stockrooms.

HIGHLIGHTS OF THE "CHICAGO" LINE:

- ★ High Carbon Heat Treated Cap Screws give added wearing qualities due to uniform hardness through entire thread structure. Ideal for all heavy-duty equipment.
- ★ Larger size Hexagon Head Cap Screws than normally stocked are available for immediate shipment.
- ★ Anti-corrosive "Chicago" stainless steel and brass fasteners in a large range of sizes and styles available for immediate shipment.

The CHICAGO SCREW COMPANY

2807 Washington Boulevard
Bellwood, Illinois

"SAFETY PLUS" Socket Set Screws, alloy and stainless • Socket Head Cap Screws, alloy and stainless, Flat Head, alloy • Socket Head Stripper Bolts • Socket Pipe Plugs • Square Head Dog Point Set Screws • Socket Keys and Key Kits • "CHICAGO" Hexagon Head Cap Screws, bright, heat treated, stainless and brass • Square Head and Headless Set Screws • Fillister and Flat Head Cap Screws • Milled Steel Studs • Hexagon Nuts, steel and brass • Castle Nuts • Taper Pins

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Columbus Die-Tool

Get production off to a profitable start! Use Columbus Die-Tool engineered tools. Jigs, Fixtures, and Special Machinery individually designed and built to produce your product alone . . . at a rate to match your production schedule. That's production economy! That's the wisdom of CDT special machinery! That's how Columbus Die-Tool can put your production on a profitable basis. Columbus Die-Tool are specialists in building special tools, jigs, fixtures and machinery . . . have been for over 46 years. Talk over your special problems with us. Absolutely no obligation. Write today.

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ESTABLISHED 1906

Manufacturers of
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SPECIAL TOOLS • UNITS FOR MACHINE TOOLS

Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Ram Type Universal

Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Turret Type

Bridgeport Machines, Inc., Linley Ave., Bridgeport, Conn.

MILLING MACHINES, Vertical

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester N. Y.
Ekstrom, Carlson & Co., 1437 Railroad Ave., Rockford, Ill.
Gorton, Geo., Mch., Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Burke Machine Tool Div., Cincinnati 27, Ohio.

1. **Increased Production.** Pope Spindles speed up output because they can take heavy cuts.
2. **Increased Wheel Life** because the shaft is rigidly supported by bearings of ample size.
3. **Super Precision Bearings** made to Pope specifications and used exclusively in Pope Spindles.
4. **Better Finished Ground Holes.** Pope precision craftsmanship assures work of the highest standard.
5. **Operating Time Saved.** One motor pulley serves all spindles except in unusual applications.
6. **No Additional Lubrication** is ever required. Thirty years of wide factory use has proven the ability of the Pope System of Sealed-in Lubrication to prolong bearing life, reduce maintenance costs and provide cool operation.
7. **Dynamic Balance.** Pope Spindles are dynamically balanced with all their rotating parts in full assembly to insure smooth running.

Pope Precision Internal Grinding Spindles come in the sizes, shaft extensions and speeds (up to 35,000 RPM) to meet your every need.

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POPE MACHINERY CORPORATION
ESTABLISHED 1920
261 RIVER STREET • HAVERHILL, MASSACHUSETTS
BUILDERS OF PRECISION SPINDLES

MODEL AND EXPERIMENTAL WORK

See Special Machinery and Tools

MOLD AND DIE COPYING MACHINES

Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

MOLDING MACHINES, Plastic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Erie Foundry Co., Erie, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Rockford Machine Tool Co., 2500 Kiswaukee St., Rockford, Ill.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div., H. K. Porter Co., Inc., Roselle, N. J.

MOTORS, Electric

Delco Products Div., General Motors Corp., 321 E. First St., Dayton, Ohio.
General Electric Co., Schenectady, N. Y.
Howell Electric Motor Co., Howell, Mich.
Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.

MOTORS, Hydraulic

Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

MULTIPLE-SLIDE FORMING MACHINES

U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

NIBBLING MACHINES

International Nickel Co., Inc., 67 Wall St., New York, N. Y.
Wales-Strippet Corp., North Tonawanda, N. Y.

NIPPLE THREADING MACHINERY

Landis Machine Co., Inc., Waynesboro, Pa.

NUT MAKING MACHINERY

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

NUT SETTING EQUIPMENT

See Screw Driving and Nut Setting Equipment.

NUT TAPPERS

See Bolt and Nut Machinery.

NUTS, Cold Forged, Wing and Cap

Chicago Screw Co., Bellwood, Ill.
Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New York, N. Y.
Union Drawn Steel Co., Div., Republic Steel Corp., Massillon, Ohio.

NUTS, Self-locking

Grip Nut Co., 310 S. Michigan Ave., Chicago 4, Ill.

NUTS, Thumb or Wing and Cap

Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only).
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

(*Continued on page* 358)

For more information on products advertised, use Inquiry Card, page 241

Henry Crown, industrialist, chairman, president and director in mining, construction, railroad and management fields, sole owner of New York's Empire State Building, which attracts more than a million visitors annually to the observatories on this 1472-foot high building.

"I multiply my eyes and ears when I read Business Publications"

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Col. Henry Crown,

President, Empire State Building Corporation

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The national association of publishers of 176 technical, professional, scientific, industrial, merchandising and marketing magazines, having a combined circulation of 4,081,858... audited by either the Audit Bureau of Circulations or Business Publications Audit of Circulation, Inc.... serving and promoting the Business Press of America... bringing thousands of pages of specialized know-how and advertising to the men who make decisions in the businesses, industries, sciences and professions... pin-pointing your audience in the market of your choice. Write for list of NBP publications and the latest "Here's How" booklet, "How Well Will We Have to Sell Tomorrow?", by Ralston B. Reid, Advertising & Sales Promotion Manager, Apparatus Sales Division, General Electric Company, Schenectady, N.Y.

OIL EXTRACTORS AND CLEANERS
De Laval Separator Co., Poughkeepsie, N. Y.

OIL GROOVERS
Fischer Machine Co., 310 No. 11th St., Philadelphia, Pa.

OIL SEALS
Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Garlock Packing Co., Palmyra, N. Y.

OILERS AND LUBRICATORS
Madison-Kipp Corp., Madison, Wis.

OILS, Cutting
See Cutting and Grinding Fluids.

OILS, Lubricating
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Sinclair Refining Co., 600 5th Ave., New York.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.

OILS, Quenching and Tempering
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Sinclair Refining Co., 600 5th Ave., New York.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.

OILS, Soluble
See Compounds, Cutting, Grinding, Metal Drawing, Etc.

OPTICAL FLATS
Crane Packing Co., 1800 Cuyler Ave., Chicago.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

ORDNANCE MACHINES, Spelial
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

PACKING, Leather, Metal, Rubber, Asbestos, Etc.
Chicago Rawhide Mfg. Co., 1309 Elston Ave., Chicago, Ill.
Crane Packing Co., 1800 Cuyler Ave., Chicago.
Garlock Packing Co., Palmyra, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Watson-Stillman Co., Div., H. K. Porter Co., Inc., Roselle, N. J.

PAINTING EQUIPMENT, Spray
Lowe Bros. Co., Dayton, Ohio.
Ransburg Electro-Coating Corp., 1234 Barth, Indianapolis, Ind.

PARALLELS
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

PATTERNS, Wood and Metal
Mummert-Dixon Co., Hanover, Pa.

PILLOW BLOCKS
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Standard Pressed Steel Co., Jenkintown, Pa.

PIPE, Brass and Copper
American Brass Co., 25 Broadway, New York, N. Y.
Mueller Brass Co., Port Huron 35, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

PIPE, Steel
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
United States Steel Corp., National Tube Co. Div., 436 7th Ave., Pittsburgh, Pa.

PIPE THREADING AND CUTTING MACHINES
Landis Machine Co., Inc., Waynesboro, Pa.

PIPE TONGS
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

PLANER ATTACHMENTS
Consolidated Mch. Tool Corp., Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave., and Penn R. R., Evanston, Cincinnati, Ohio.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

PLANERS, Double Housing and Openside
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio (Plate).
Consolidated Mch. Tool Corp. (Incl. Plate, Rotary and Crank Types), Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A. Co., Woodburn Ave., and Penn R. R., Evanston, Cincinnati, Ohio.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.

PLATE ROLLS
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

PLATES, Angle
Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa.

PLATES, Surface
Brown & Sharpe Mfg. Co., Providence, R. I.
Brush Electronics Co., 3405 Perkins Ave., Cleveland, Ohio.
Challenge Machinery Co., Grand Haven, Mich.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Pratt & Whitney Div., West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Vinco Corp., 9113 Schaefer Highway, Detroit 28, Mich.

PNEUMATIC EQUIPMENT
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Ingersoll-Rand Co., Phillipsburg, N. J.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Onsrud Machine Works Inc., 3940 Palmer St., Chicago, Ill.

POLISHING LATHES AND MACHINES
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hirshmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Millers Falls Co., Greenfield, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

POLISHING TOOLS, Portable
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

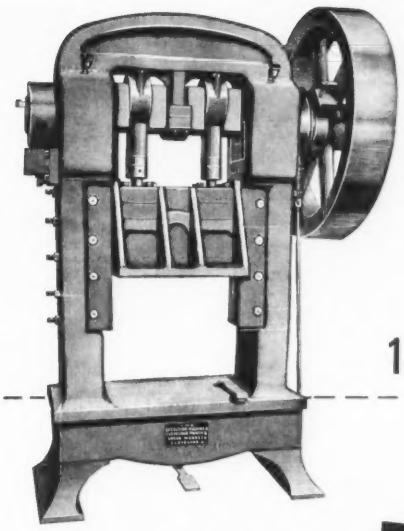
POWER UNITS, Hydraulic
See Hydraulic Power Units or Tools Heads

PRESSES, Arbor
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
duMont Corp., Greenfield, Mass.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Lempco Products, Inc., Bedford, Ohio.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Tomkins-Johnson Co., 614 No. Mechanic St., Jackson, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N.J.

PRESSES, Broaching
American Broach & Mch. Co., Ann Arbor, Mich.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Ferracute Machine Co., Bridgeton, N. J.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

(*Continued on page 360*)

For more information on products advertised, use Inquiry Card, page 241



1880

1955

Cleveland S2-350-84-48 Two Point Press, double geared, equipped with Drum Type Friction Clutch, air brake on flywheel and air counterbalance to slide; capacity—350 tons.

PREPARED FOR THE FUTURE

1955 marks the seventy-fifth anniversary of the founding of The Cleveland Punch and Shear Works Company.

On this our seventy-fifth year we express our sincere appreciation to the customers we have been privileged to serve and who have made possible our continued expansion and growth.

We look to the future with confidence in the knowledge that our many years of close association with the metal working industry have prepared us for greater accomplishments in the years to come. We take this opportunity to rededicate ourselves to ever greater service to our customers by continuously improved machine quality and performance.

After seventy-five years of machine tool progress we are proud of the past and prepared for the future.

AA-686

THE CLEVELAND PUNCH & SHEAR WORKS CO.

Established 1880

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PRESSES, Extrusion

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PRESSES, Foot

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.

PRESSES, Forging

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd., and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W. Canton, Ohio.
Clearing Mch. Corp., Div. U. S. Industries, Inc. 6499 W. 65th St., Chicago, Ill.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Erie Foundry Co., Erie, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg., Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
National Mchry. Co., Greenfield and Stanton Sts. Tiffin, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div., H. K. Porter Co., Inc., Roselle, N. J.

PRESSES, Hydraulic

American Broach & Mch. Co., Ann Arbor, Mich.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W. Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Cincinnati Milling Mch. Co. (Hydroform) Cincinnati 9, Ohio.
Clearing Mch. Corp., Div. U. S. Industries, Inc. 6499 W. 65th St., Chicago, Ill.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit, Mich.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div., H. K. Porter Co., Inc., Roselle, N. J.

PRESSES, Screw

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.

PRESSES, Sheet Metal Working

Allen, Alva F., Box 426, Clinton, Mo. (Bench)
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Cincinnati Milling Mch. Co. (Hydroform) Cincinnati 9, Ohio.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Clearing Mch. Corp., Div. U. S. Industries, Inc. 6499 W. 65th St., Chicago, Ill.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Erie Foundry Co., Erie, Pa.
Espen-Lucas Machine Works, Front St., and Girard Ave., Philadelphia, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
L & J Press Corp., Elkhart, Ind.
Minster Machine Co., Minster, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Wales-Strippet Corp., North Tonawanda, N. Y.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PRESSES, Straightening

American Steel Foundries, Elmes Engrg. Div., Paddoak Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Erie Foundry Co., Erie, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lempco Products, Inc., Bedford, Ohio.
Niagara Machine & Tool Works (Hydraulic), 683 Northland Ave., Buffalo, N. Y.
Springfield Mch. Tool Co., Springfield, Ohio.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PROFILE—TRACING ATTACHMENTS

Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa. (Lathe).

PROFILING MACHINES

Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, George Machine Co., 1110 W. 13th St., Racine, Wis.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.

(*Continued on page* 362)

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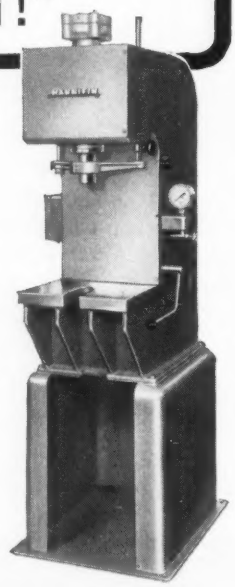

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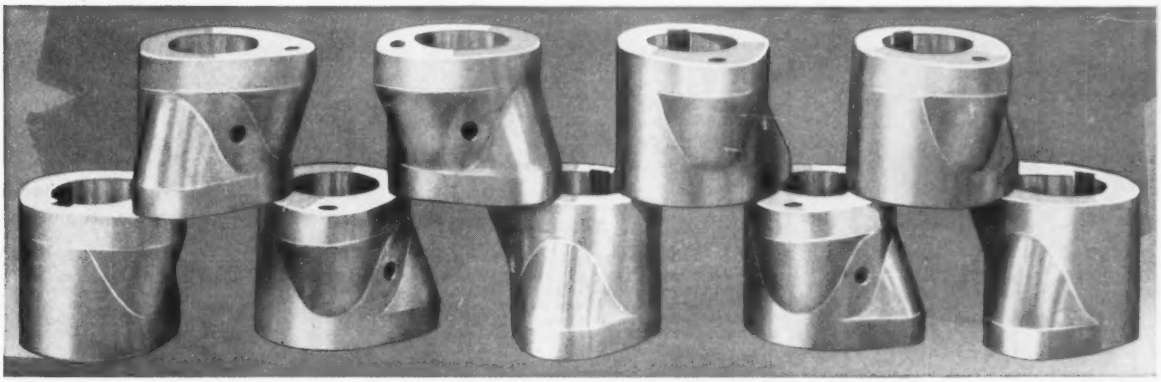

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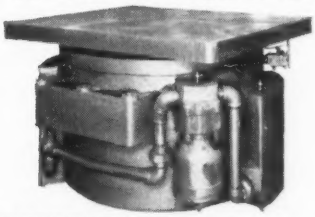

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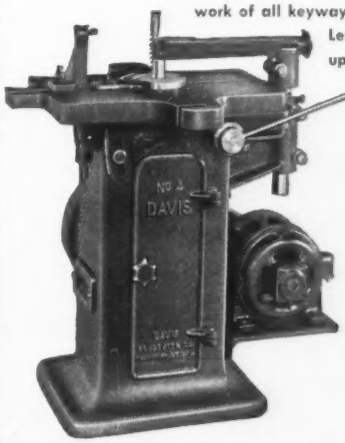

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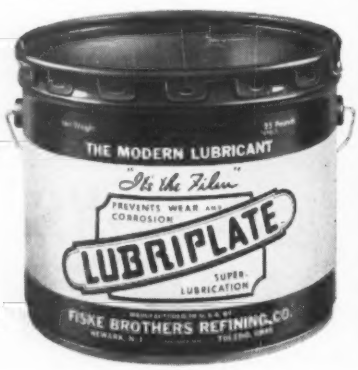

PULLEYS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

PULLEYS, Friction Clutch

Brown & Sharpe Mfg. Co., Providence, R. I.

PUMPS, Coolant, Lubricant and Oil

Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., 620 E. Vienna Ave., Milwaukee, Wis.
Ingersoll-Rand Co., Phillipsburg, N. J.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Pioneer Pump Div., Detroit Harvester Co., 14300 Tireman Ave., Detroit 28, Mich.
Ruthman Machinery Co., 1809 Reading Rd., Cincinnati 12, Ohio.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tompkins-Johnson Co., Jackson, Mich.
Vickers Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engrg. Co., Chambersburg, Pa.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Ingersoll-Rand Co., Phillipsburg, N. J.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Pioneer Pump Div., Detroit Harvester Co., 14300 Tireman Ave., Detroit 28, Mich.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.
Vinco Corp., 9113 Schaefer Highway, Detroit 28, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PUMPS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg. N. J.

PUMPS, Rotary

Brown & Sharpe Mfg. Co., Providence, R. I.
Pioneer Pump Div., Detroit Harvester Co., 14300 Tireman Ave., Detroit 28, Mich.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

PUNCHES AND DIES

See Dies, Sheet Metal, Etc.

PUNCHES, Centering

Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

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Allen, Alva F., Box 426, Clinton, Mo.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Ryerson, Joseph T., & Son Inc., 2558 W. 16th St., Chicago 18, Ill.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Wales-Strippet Corp., North Tonawanda, N. Y.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wiedermann Machine Co., 4272 Wissahickon Ave., Philadelphia, Pa.

RACKS, Gear Cut

Amgears, Inc., 6633 W. 65th St., Chicago 38, Ill.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Massachusetts Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Clevelnad 14, Ohio.

REAMER HOLDERS

Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Warner & Swasey Co., 8701 Carnegie Ave., Cleveland 3, Ohio.

REAMERS

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 27, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 1440 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

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Barber-Colman Co., Rock and Montague, Rockford, Ill.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

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Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 1440 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

REAMERS, Taper Pin

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Kaufman Manufacturing Co., Manitowoc, Wis.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twists Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

REAMING MACHINES

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Kaufman Manufacturing Co., Manitowoc, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

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Norton Co., 1 New Bond St., Worcester 6, Mass.

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General Electric Co., Schenectady, N. Y.

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Oakite Products, Inc., 19 Rector St., New York, N. Y.

RETAINING RINGS FOR BEARINGS, Etc.

Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Waldes-Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

RHEOSTATS

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.

RIVET SETS

Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

RIVETERS, Hydraulic

Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., 6 E 44th St., New York, N. Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.

RIVETERS, Pneumatic

Chicago Pneumatic Tool Co., 6 E 44th St., New York, N. Y.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St. Chicago 18, Ill.
Wood & Co., R. D., Public Ledger Bldg., Philadelphia, Pa.

RIVETING MACHINES

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Tomkins-Johnson Co., Jackson, Mich.

RIVET MAKING MACHINES

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

RUBBER PRODUCTS

Garlock Packing Co., Palmyra, N. Y.

RULES, Steel

Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S. Co., Athol, Mass.

(*Continued on page* 364)

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Parker Rust Proof Co., 2194 E. Milwaukee, Detroit 11, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAND BLAST EQUIPMENT
See Blast Cleaning Equipment

SANDERS
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.
Millers Falls Co., Greenfield, Mass.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

SAW BLADES, Hack
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Atkins Saw Div., Borg-Warner Corp., 402 S. Illinois St., Indianapolis 9, Ind.
Barnes, W. O. Co., Inc., Detroit, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Millers Falls Co., Greenfield, Mass.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S. Co., Athol, Mass.

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Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

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Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.

SAWING MACHINES, Friction
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

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(*Continued on page 367*)

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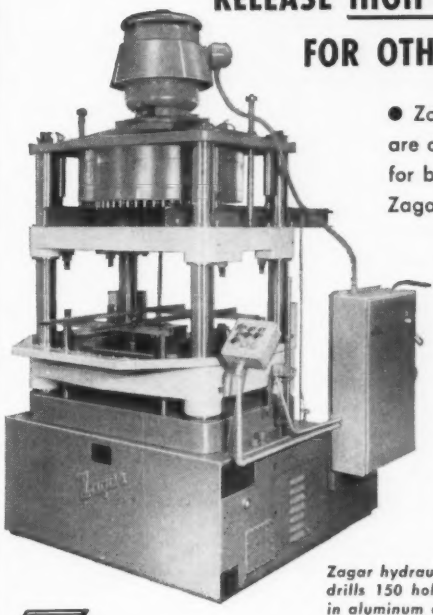

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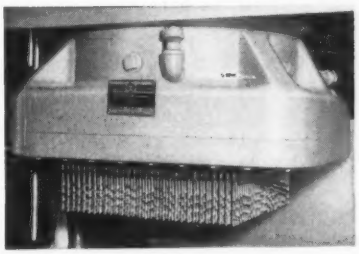

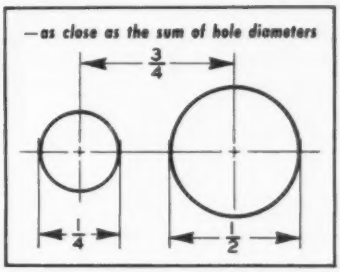

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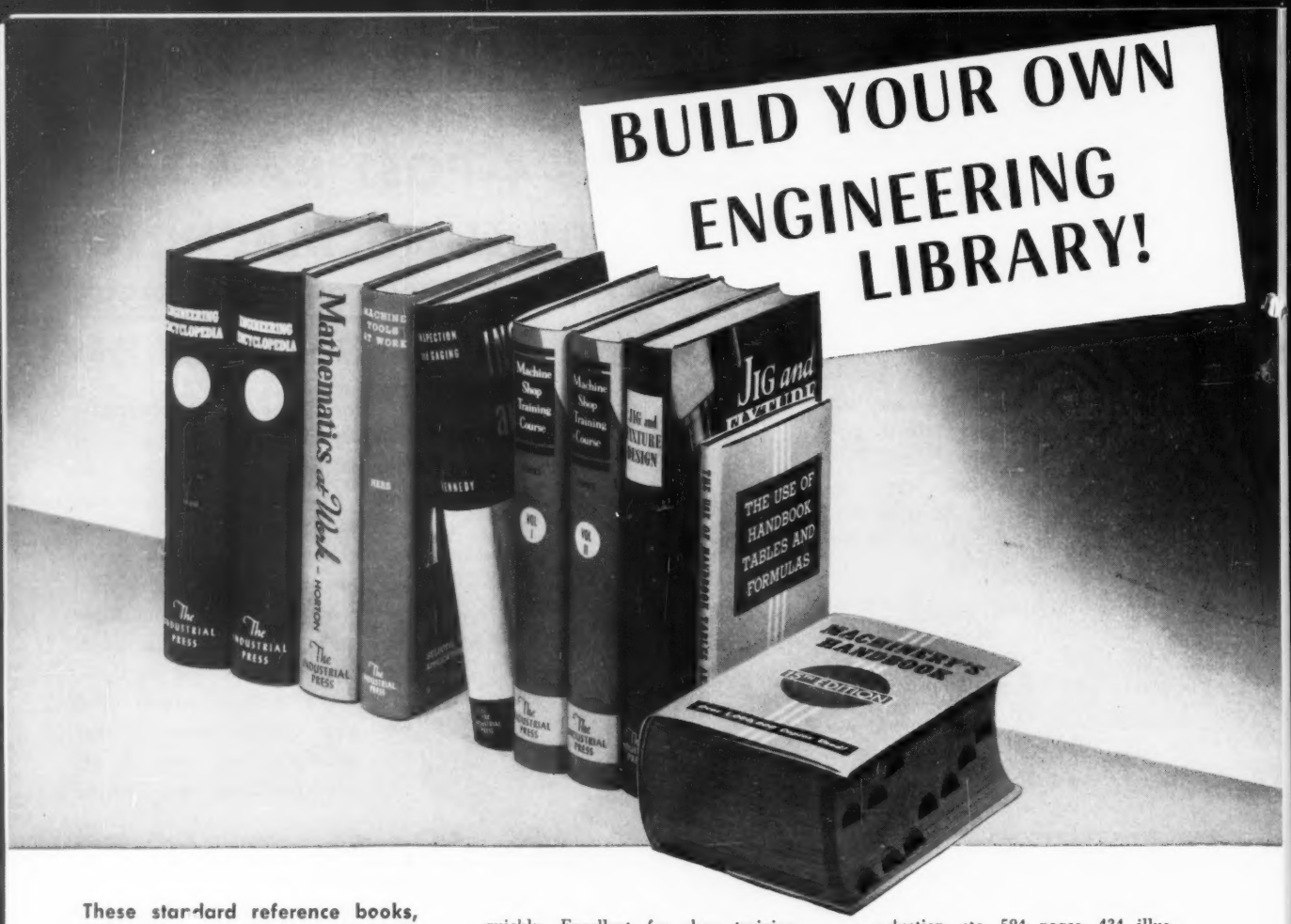

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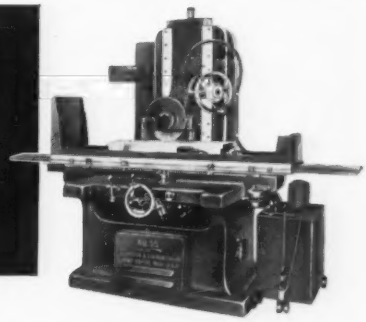

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Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth 2, Mich.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.
Waltham Machine Works, Newton St., Waltham, Mass.
Zagar Tool Co., 24000 Lakeland Blvd., Cleveland 23, Ohio.

SPEED REDUCERS

Boston Gear Work, 320 Main St., North Quincy 71, Mass.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears, Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
General Electric Co., Schenectady, N. Y.
Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Perkins Machine & Gear Co., West Springfield, Mass.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.

SPINDLES, Boring and Milling

Pope Mchry. Corp., Haverhill, Mass.

SPINDLES, Grinding

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Pope Mchry. Corp., Haverhill, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

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SPINNING LATHES

See Chucking Machines.

SPROCKET CHAINS

Boston Gear Work, 3200 Main St., North Quincy 71, Mass.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.

SPROCKETS

Boston Gear Work, 3200 Main St., North Quincy 71, Mass.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

STAMPINGS, Sheet Metal

Laminated Shim Co., Inc., Glenbrook, Conn.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp., Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 Ave., Pittsburgh, Pa.
Wheeler-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Cold Drawn

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Crucible Steel Co. of America, Oliver Bldg. Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., (American Steel & Wire Co., Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, High Speed Tool

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 Armstrong Ave., Chicago, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Machine

Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Stainless

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp., Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Strip and Sheet

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp., Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

STEEL, Tool and Die

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL, Zinc, Tin and Copper Coated Strip

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

STEEL ALLOYS

See Alloys, Steel

STEEL BARS

See Bars, Steel

STEEL STOCK GROUND FLAT

Brown & Sharpe Mfg. Co., Providence, R. I.
Starrett, The L. S., Co., Athol, Mass.

STELLITE

Haynes Stellite Div., Union Carbide & Carbon Corp. (Alloy), 30 E. 42nd St., New York, N. Y.

STOCK STOPS

Wohlnip Engineering Co., 390 Hillside Ave., Hillside, N. J.

(*Continued on page 370*)

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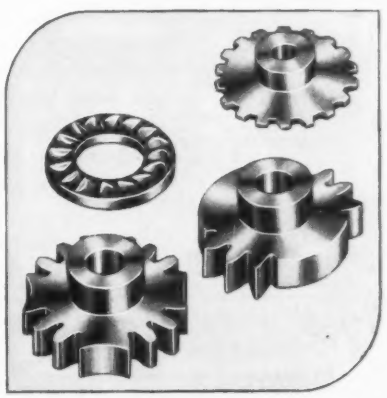

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Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
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Card, S. W., Mfg. Co., Div. of Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Threadwell Tap & Die Co., Greenfield, Mass.

STONES, Oil or Sharpening

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worcester 6, Mass.

STOOLS

Standard Pressed Steel Co., Jenkintown, Pa.

STRAIGHTEDGES

Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

STRAIGHTENERS, Flat Stock and Wire

U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

STRAIGHTENING MACHINERY

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Consolidated Mch. Tool Corp., Rochester, N.Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Springfield Mch. Tool Co., Springfield, Ohio.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

STUD SETTERS

Errington Mechanical Laboratory Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

SUB-PRESSES

Waltham Machine Works, Newton St., Waltham, Mass.

SUPERFINISHING MACHINES

Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

SURFACE CHECKING EQUIPMENT

Micrometrical Mfg. Co., 321 S. Main St., Ann Arbor, Mich.

SURFACE PLATES

See Plates, Surface

SWAGING MACHINES

Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.

SWITCHES

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.

TACHOMETERS

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

TANGS, Replaceable, Drill & Reamer

Nu-Tangs Inc., 1335 Bates St., Cincinnati, Ohio.

TAPER PINS, Standard

Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only.)
Chicago Screw Co., Bellwood, Ill.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Gillen, John, Co., Inc., 2540 S. 50th Ave., Cicero 50, Ill.
Pratt & Whitney, West Hartford 1, Conn.

TAP HOLDERS

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
McCrosky Tool Co., 1938 Thomas St., Meadville, Pa.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Tapmatic Corp., 845 W. 16th St., Costa Mesa, Cal.

TAPPING ATTACHMENTS AND DEVICES

Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Leland-Gifford Co., 1425 Southbridge St., Worcester, Mass.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.

TAPPING MACHINES

Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 70, Ohio.
Barnes Drill Co., 814 Chestnut Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wasson Ave., Springfield 7, Mass.
Bodine Corp., 317 Mt. Grove St., Bridgeport, Conn.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Challenge Mchry. Co., Grand Haven, Mich.
Cleveland Tapping Machine Co., Canton 6, Ohio.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Kaufman Manufacturing Co., Manitowoc, Wis.
Kingsbury Mch. Tool Corp., Keene, N. H.

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Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Millholland, W. K. Machinery Co., 6402 Westfield, Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

TAPPING MACHINES, Nut

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

TAPS

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Continental Tool Works, Div. Ex-Cell-O-Corp., Detroit 32, Mich.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Mch. Co. (Solid Adjustable), Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Threadwell Tap & Die Co., Greenfield, Mass.

TAPS, Collapsing

Geometric Tool Co., Westville Station, New Haven 15, Conn.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.

TESTING EQUIPMENT, Tension, Compression, Fatigue, etc.

Olsen Tinius, Testing Machine Co., Philadelphia, Pa.

THREAD CUTTING MACHINERY

Brown & Sharpe Mfg. Co., Providence, R. I.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Coulter, James, Machine Co., Bridgeport 5, Conn.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Eastern Mch. Screw Corp., New Haven, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Kaufman Manufacturing Co., Manitowoc, Wis.
Landis Mch. Co., Waynesboro, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Taft-Pierce Mfg., Co., Woonsocket, R. I.

THREAD CUTTING TOOLS

Armstrong Bros. Tool Co., 5200 Armstrong Ave., Chicago, Ill.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
Eastern Mch. Screw Corp., New Haven, Conn.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Mch. Co., Waynesboro, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

THREAD GAGES

See Gages, Thread.

THREAD GRINDING MACHINES

See Grinding Machines, Thread

THREAD MILLING MACHINES

Coulter, James, Machine Co., Bridgeport 5, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Waltham Machine Works, Newton St., Waltham, Mass.

THREAD ROLLING HEADS

National Acme Co., 170 E. 131st St., Cleveland, Ohio.

THREAD ROLLING MACHINES

Landis Machine Co., Waynesboro, Pa.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.

TIN AND TERNEPLATES

Bethlehem Steel Co., Bethlehem, Pa.
U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

TOOL BITS, High Speed Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Carpenter Steel Co., Reading, Pa.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
du Mont Corp., Greenfield, Mass.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TOOL BITS, Special Alloy

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

(*Continued on page 372*)

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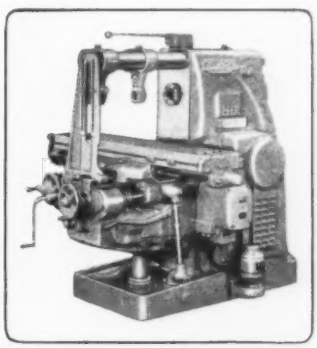

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TOOL GRINDING ATTACHMENTS

Detroit Reamer & Tool Co., 2830 E. 7 Mile Rd., Detroit, Mich.

TOOL HOLDERS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
Portage Double Quick Tool Co., 1063 Sweitzer Ave., Akron 11, Ohio.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill. (Turret)
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TOOLMAKERS' INSTRUMENTS

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

TOOL RESINS

Marblette Corp., 37-33 Thirtieth St., Long Island City 1, N. Y.

TOOL STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Vanadium Alloys Steel Co., Latrobe, Pa.

TOOLS, Carbide-Tipped

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Colonial Broach Co., Detroit 13, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Kennametal, Inc., Latrobe, Pa.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Valenite Metals Corp., Box 205, Royal Oak, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

TOOLS, Lathe, Shaper and Planer

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Super Tool Co., 21650 Hoover Road, Detroit 13, Mich.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TRANSFER MACHINES, Automatic

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TRANSFORMERS

General Electric Co., Schenectady, N. Y.

TRANSMISSION, Variable Speed

Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Reliance Electric & Engrg. Co., 1047 Ivanhoe Rd., Cleveland 10, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TUBE FLANGING MACHINES

Grant Mfg. & Mch. Co., 90 Sillman St., Bridgeport 5, Conn.

TUBE FORMING AND WELDING MACHINES

Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

TUBE MILLS

Abbey-Etna Co., 2444 Maplewood Ave., Toledo 10, Ohio.
American Electric Fusion Corp., 2622 Diversey Ave., Chicago, Ill.
Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

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Mueller Brass Co., Port Huron 35, Mich.
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Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
National Tube Div. U. S. Steel Corp., 525 Wm. Penn Place, Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.

TWIST DRILLS
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UNIVERSAL JOINTS
Baush Machine Tool Co., 156 Wassen Ave., Springfield 7, Mass.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Gear Grinding Machine Co., 3901 Christopher St., Detroit 11, Mich.

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Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Philadelphia Gear Works (Motorized), Erie Ave. and G St., Philadelphia, Pa.

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Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.
Lehigh Foundries, Inc., 1500 Leigh Dr., Easton, Pa.
Rivett Lathe & Grinder Inc., Brighton, Boston 35, Mass.
Ross Operating Valve Co., 120 E. Golden Gate, Detroit, Mich.

VALVES, Hydraulic
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
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Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lehigh Foundries, Inc., 1400 Lehigh Dr., Easton, Pa.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
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Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

VIBRATION INSULATION
American Felt Co., Glenville, Conn.

VISES, Machine
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Donovan Mfg. Co., 82 Batterymarch St., Boston 10, Mass.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Universal Engineering Co., Frankenmuth 2, Mich.
U. S. Burke Machine Tool Div., Brotherton Rd. 17, Cincinnati 27, Ohio.

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Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

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Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
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Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only.)
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General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.

WELDING EQUIPMENT, Electric, Spot, Butt, Seam, Etc.
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Expert Welding Machine Co., 17144 Mt. Elliott Ave., Detroit 12, Mich.
Federal Machine & Welder Co., Warren, Ohio.

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(Continued on page 374)

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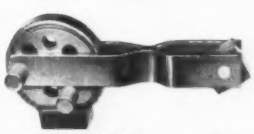

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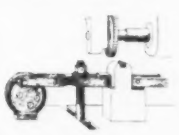

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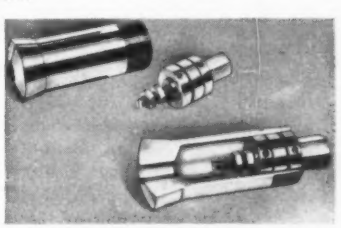

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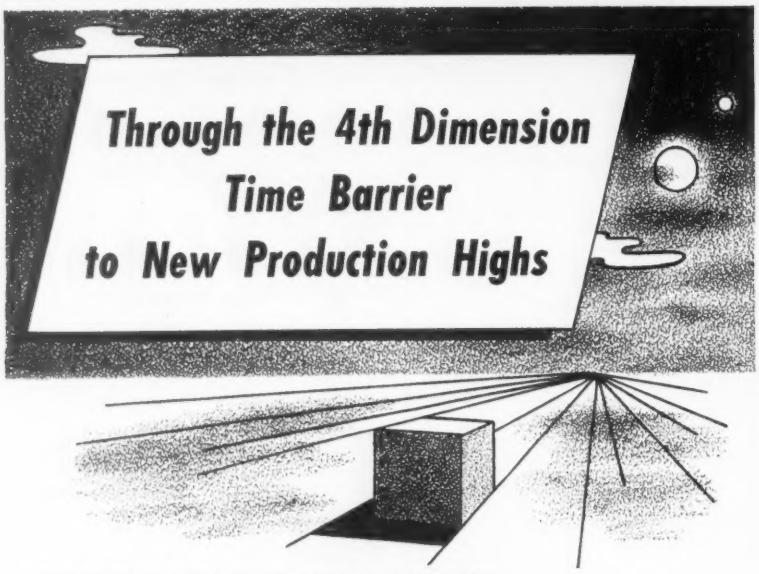

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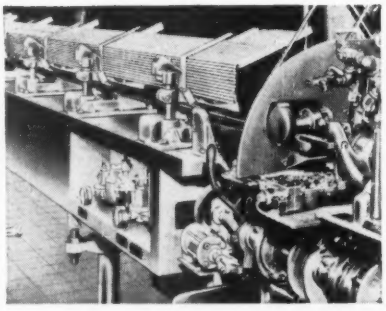

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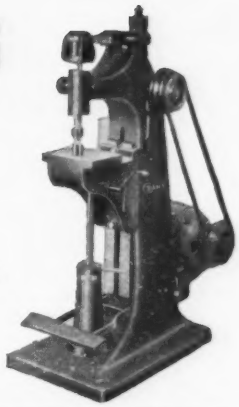

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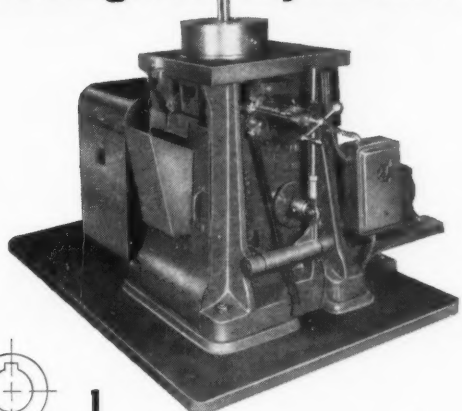

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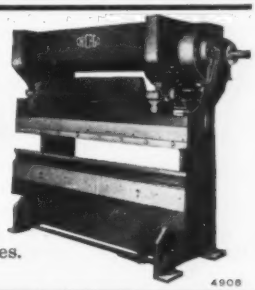

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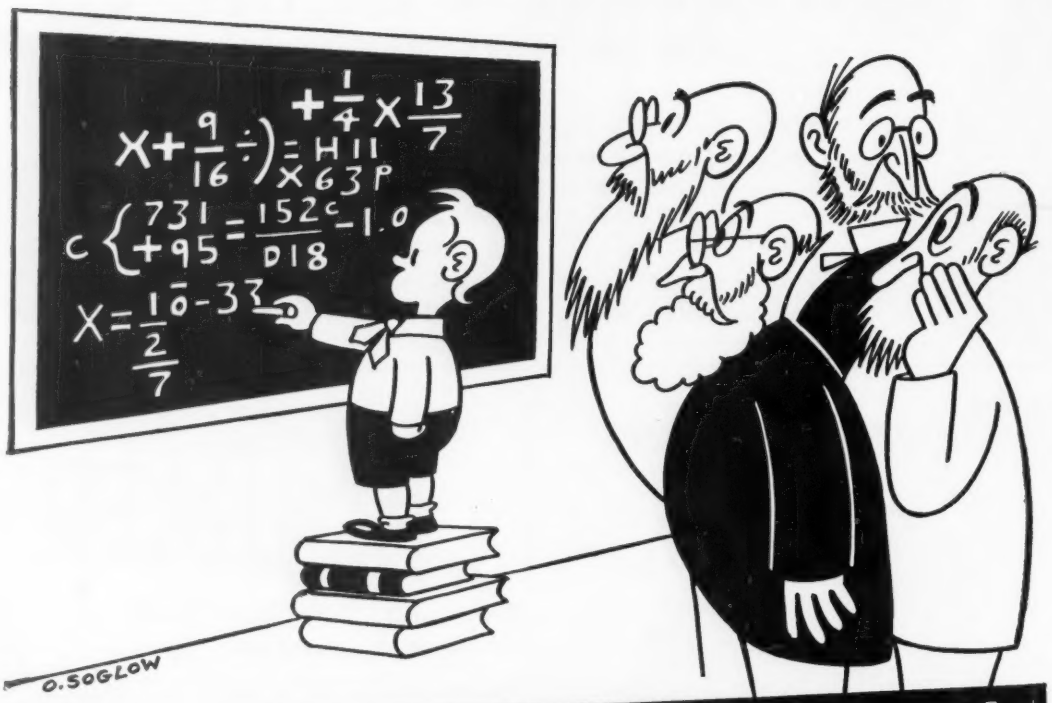

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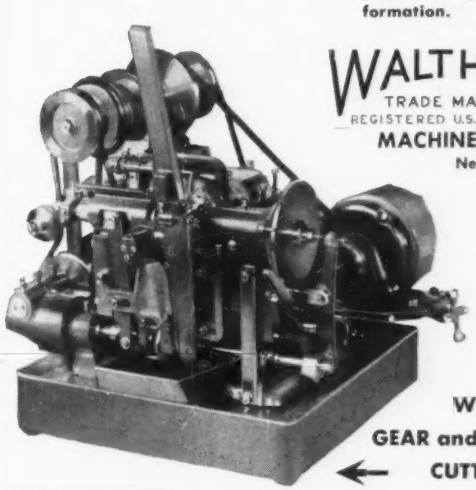

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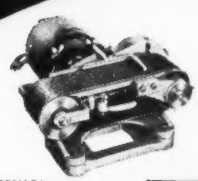

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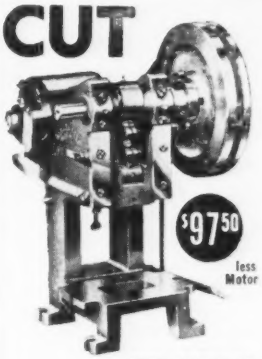

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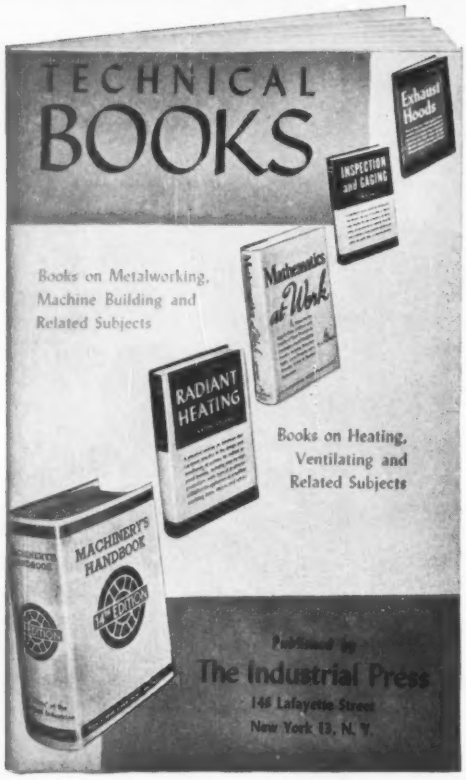

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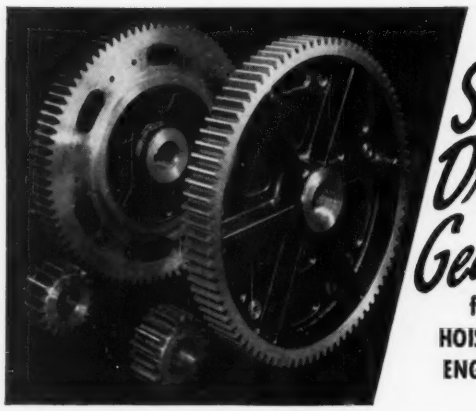

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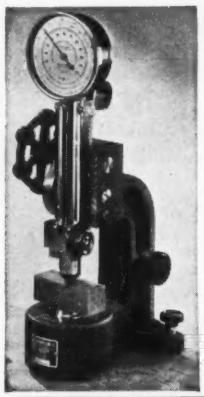

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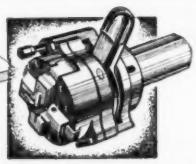

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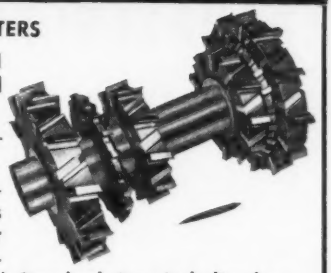

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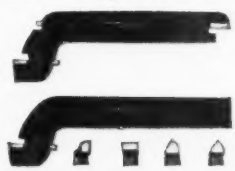

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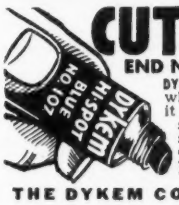

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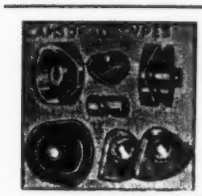

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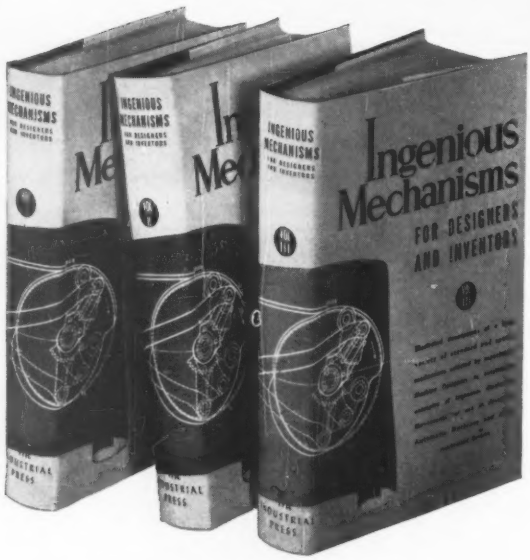

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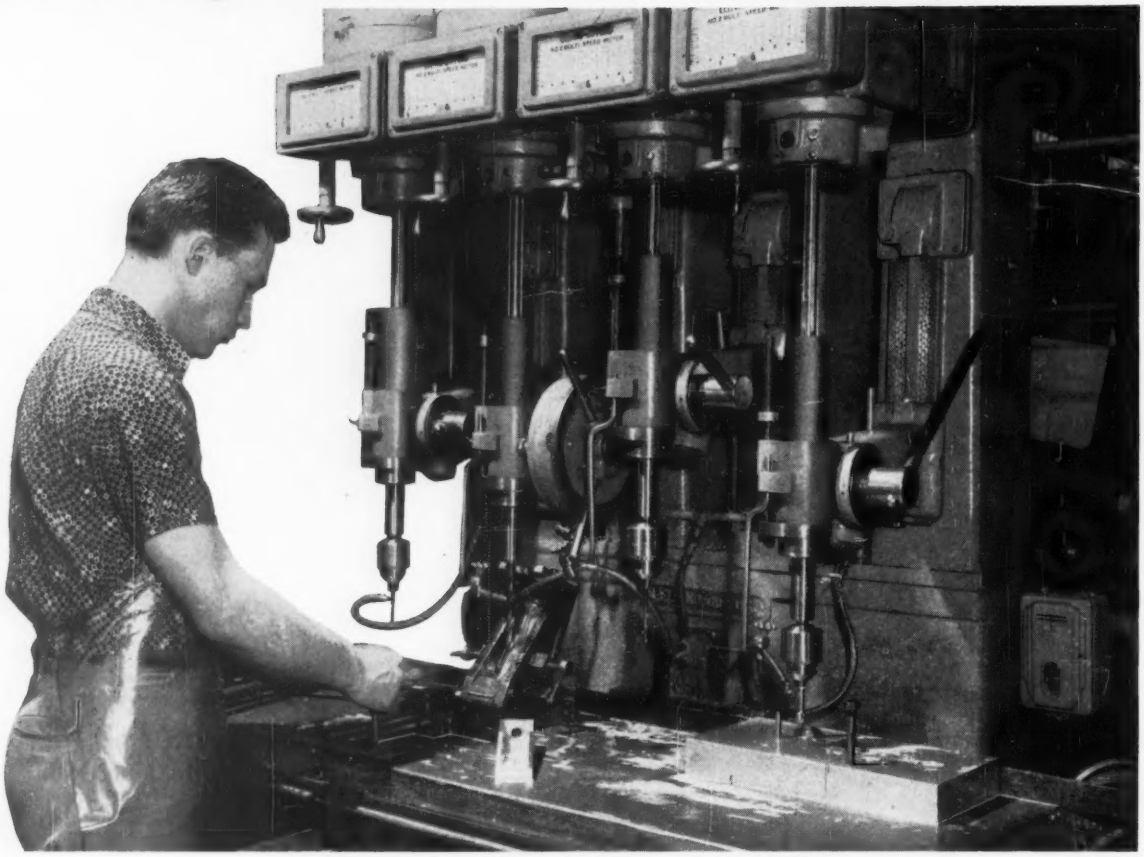

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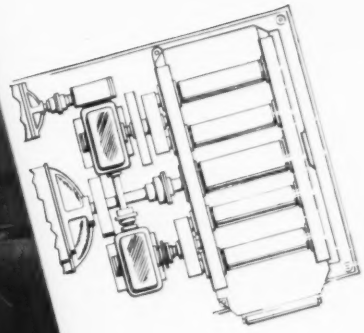

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